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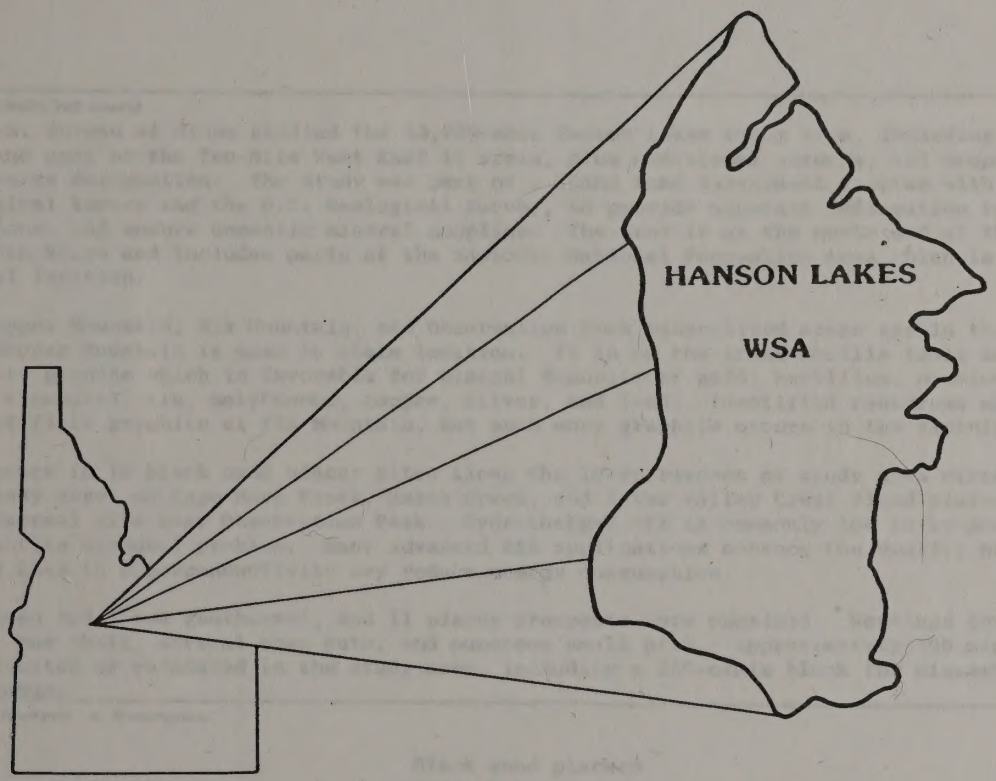
Mineral Resources of the Hanson Lakes Wilderness Study Area, Boise and Custer Counties, Idaho



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16. Abstract (Limit: 200 words)

The U.S. Bureau of Mines studied the 63,985-acre Hanson Lakes study area, including the Ten Mile-East and part of the Ten-Mile West RARE II areas, plus additional acreage, all proposed at times for Wilderness designation. The study was part of a Idaho Land Assessment Program with the Idaho Geological Survey and the U.S. Geological Survey, to provide minerals information for land-use decisions, and ensure domestic mineral supplies. The area is at the north end of the rugged Sawtooth Range and includes parts of the Sawtooth National Recreation Area which is closed to mineral location.

The Copper Mountain, Elk Mountain, and Observation Peak mineralized areas are in the study area, but only Copper Mountain is open to claim location. It is on the trans-Challis fault zone and contains Tertiary granite which is favorable for mineral deposits of gold, beryllium, niobium, REE (rare-earth elements), tin, molybdenum, copper, silver, and lead. Identified resources are 1.9 million tons of flake graphite at Elk Mountain, but much more graphite occurs in the vicinity..

REE occurs in 18 black sand placer sites along the lower reaches of study area streams just outside the study area, on Cape Horn Creek, Marsh Creek, and lower Valley Creek flood plains, and at one hydrothermal site near Observation Peak. Hydrothermal REE is commonly low in by-product thorium, a radioactive disposal problem. Many advanced REE applications enhance the quality of life, and future uses in superconductivity may reduce energy consumption.

Seventeen lode, one geothermal, and 11 placer prospects were examined. Workings totaled about 20 adits, one shaft, several open cuts, and numerous small pits. Approximately 500 mining claims have been located or relocated in the study area, including a 200-claim block for disseminated molybdenum.

17. Document Analysis a. Descriptors

Gold
REE (rare-earth elements)
Graphite
Niobium
Molybdenum
Black sand placers
Hydrothermal
Mineral resources
Thorium
Mining

b. Identifiers/Open-Ended Terms

Trans-Challis fault zone
Copper Mountain mineralized area
Elk Mountain mineralized area
Observation Peak mineralized area
Sawtooth National Recreation Area
Superconductivity
Idaho
Tertiary granite

c. COSATI Field/Group

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PREFACE

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Bureau of Mines and U.S. Geological Survey to survey certain areas of Federal lands ". . . to determine the mineral values, if any, that may be present . . ." Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a Bureau of Mines mineral investigation of the Hanson Lakes study area, Boise and Custer Counties, ID, which includes the lands in roadless areas E4-601 (Ten Mile-East), recommended for Wilderness, and N4-061 (Ten-Mile West) recommended for Non-Wilderness during the Second Roadless Area Review (RARE II) by the U.S. Forest Service, January, 1979. These areas and some additional acreage have been proposed for Wilderness in various Congressional proposals. Mining-related activities in the study area would be severely restricted under Wilderness designation.

This open-file report contains data gathered and interpreted by personnel of the U.S. Bureau of Mines, Western Field Operations Center, Branch of Resource Evaluation, East 360 Third Avenue, Spokane, WA 99202. This report has been approved by the Branch of Mineral Land Assessment, Washington, D.C.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

cubic yard	yd^3
degree	°
dollar per cubic yard	$/$yd^3$
foot	ft
inch	in.
mile	mi
part per billion	ppb
part per million	ppm
percent	%
pound	lb
ton per day	tpd
troy ounce	oz
troy ounce per ton	oz/ton

SUMMARY

This report is part of the USBM (U.S. Bureau of Mines) Idaho Land Assessment Program, to study the mineral resources of priority roadless areas in central Idaho. The study provides minerals information to the President, Congress, land management agencies, and the public to make wise land management decisions, and helps ensure an adequate, dependable supply of minerals at a reasonable cost.

The 63,985-acre Hanson Lakes study area is a composite of two RARE II areas, Ten Mile-East and a portion of Ten Mile-West, plus other lands included in previous Congressional wilderness proposals. Access is by Idaho State Highway 21, between Lowman and Stanley. The study area includes the northern extension of the rugged Sawtooth Range. The Sawtooth Wilderness is contiguous to the southeast. About 40% of the study area is in the Sawtooth National Recreation Area. Mining is severely restricted in the wilderness and national recreation area.

Three mineralized areas, Copper Mountain, Elk Mountain, and Observation Peak, are in the study area; Copper Mountain is the only one outside the recreation area and open to claim location. The Copper Mountain area lies within the trans-Challis fault zone and includes Tertiary-age igneous rocks, features associated with mineral deposits in the region. The Tertiary granite is a possible source rock for gold, beryllium, niobium, rare-earth elements, tin, molybdenum, copper, silver, and lead. Mineral resources have not been identified, but several sites have concentrations of gold, molybdenum, rare earth, and other mineral deposit indicator-elements.

The Elk Mountain mineralized area has identified mineral resources, about 370,000 tons of measured and 1.5 million tons of indicated subeconomic flake graphite, which contains 3.16 percent carbon. These resources are adjacent to the study area. The mineralized area, however, is permissive for the existence of one billion tons of graphite resources, part of which would be in the study area. Gold at Elk Mountain occurs in association with an apparently near-surface intrusive contact between granitic rock and overlying metasediment, suggesting possible near-surface deposits.

Rare-earth occurrences were found at 19 sites, 18 placer and one lode (hydrothermal). Rare-earth elements are increasingly important to advanced applications, such as in superconductivity. Potentially mineable concentrations of rare-earth-bearing gravels occur in the flood plains of Cape Horn, Marsh, and lower Valley Creeks, which are mainly adjacent to the study area. Marsh and Valley Creek occurrences are along the lowest reaches of tributaries which drain the study area. The placer occurrences also contain thorium, a radioactive mineral. A hydrothermal rare-earth occurrence in the Observation Peak mineralized area is of interest, because rare-earths produced from hydrothermal minerals commonly have no thorium. Granitoid rocks in the Observation Peak area also contain weak concentrations of disseminated gold.

Twenty-nine prospects were examined, including 17 lode and disseminated prospects, a geothermal prospect, and 11 placer prospects. Workings totaled approximately 20 adits and one shaft, most of which were caved, several open-cuts, and numerous small pits. Approximately 500 mining claims were located or relocated in the study area, including a 200-claim block located for disseminated molybdenum.

INTRODUCTION

This report is part of the USBM (U.S. Bureau of Mines) Idaho Land Assessment Program to study the mineral resources of priority roadless areas in Idaho. The results of mineral inventories on specific study areas, such as Hanson Lakes, provide minerals information needed by the President, the Congress, land management agencies, and ultimately, by the public, to make wise decisions regarding future land management practices. The information also helps fulfill a long-term Bureau of Mines objective, to ensure the nation has an adequate, dependable supply of minerals at a reasonable economic and environmental cost.

The 63,985-acre Hanson Lakes study area, the subject of various Congressional wilderness proposals, is a composite of two RARE II areas [delineated in the second USFS (U.S. Forest Service) Roadless Area Review and Evaluation], plus some additional acreage. The RARE II areas are the Recommended Nonwilderness portion of the Ten Mile-West area (N4-061), and the Ten Mile-East area (E4-061), Recommended Wilderness by the USFS. About 60% of the study area is in the Challis NF (National Forest) and 40% in the Boise NF. However, most of the Challis NF portion (the east-central part) of the study area, and a small fraction of the Boise NF portion (the southeast corner) of the area, are within and are administered by the SNRA (Sawtooth National Recreation Area) personnel.

Geographic Setting

Hanson Lakes study area is accessed by State Highway 21, either from Lowman and Boise to the southwest, Stanley and Ketchum to the south, or Stanley and Challis to the northeast (fig. 1). The study area (pl. 1 and fig. 2) contains the northernmost physiographic extension of the rugged Sawtooth Range, and is contiguous with the Sawtooth Wilderness to the southeast. Mountains in the area, while not as precipitous as those in the Wilderness, have ice-carved, rocky ridges rising above the timber to 9,300 ft, and broad, U-shaped valleys with wetland meadows. The northeast part of the area is a high, rolling tableland forested with subalpine species of fir, lodgepole pine, and whitebark pine, as well as Engleman spruce, Douglas fir, and aspen. To the southwest, the land plunges sharply into canyons, to a minimum elevation of about 4,800 ft at the confluence of the South Payette River and Canyon Creek. Ponderosa pine and Douglas fir predominate at these low elevations, and black cottonwood line the streams.

The climate consists of frigid, long, and snowy winters, and short, dry summers. Although affected by elevation, the mean minimum

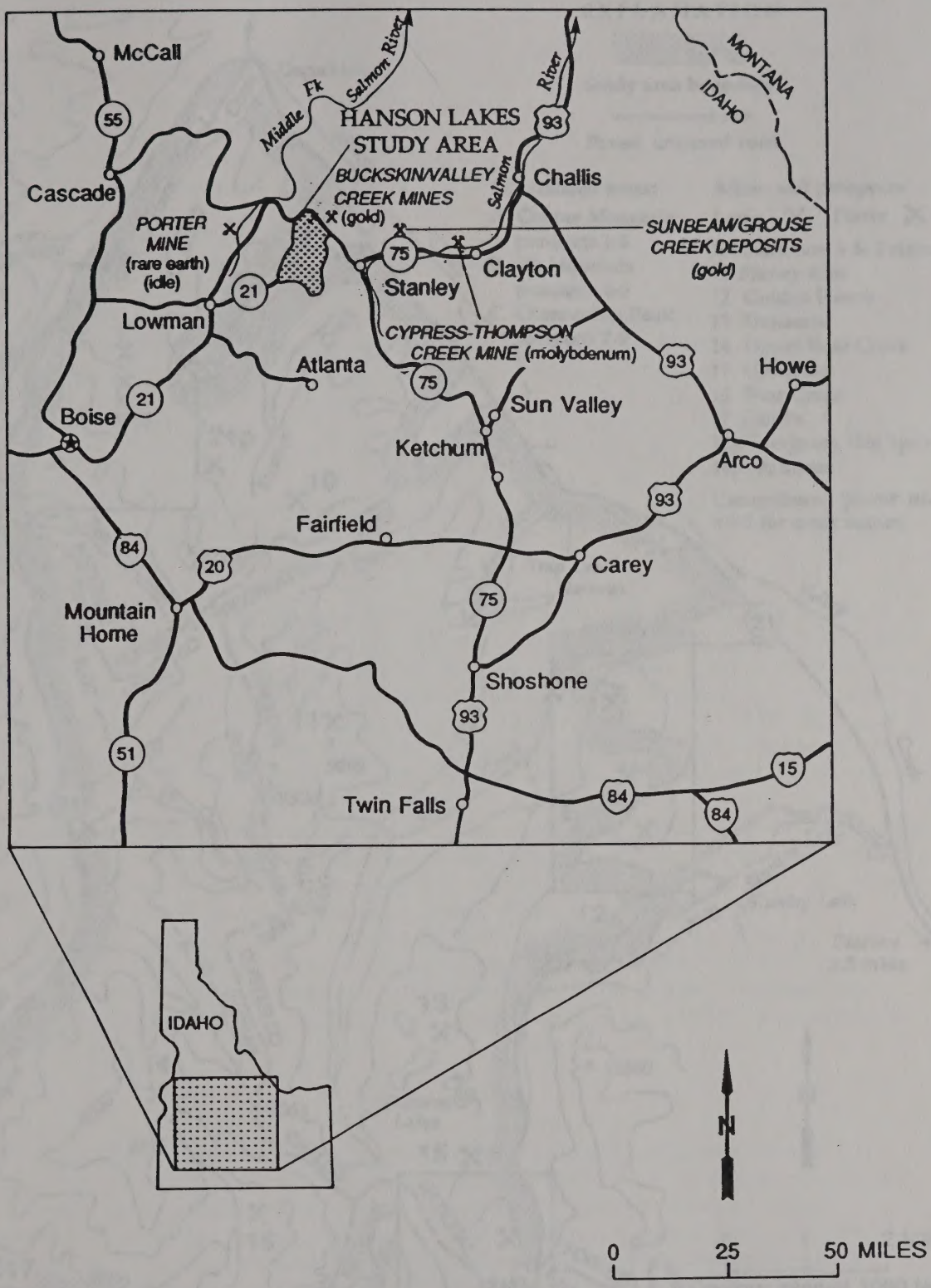


Figure 1.- Location of the Hanson Lakes study area, Boise and Custer Counties, Idaho

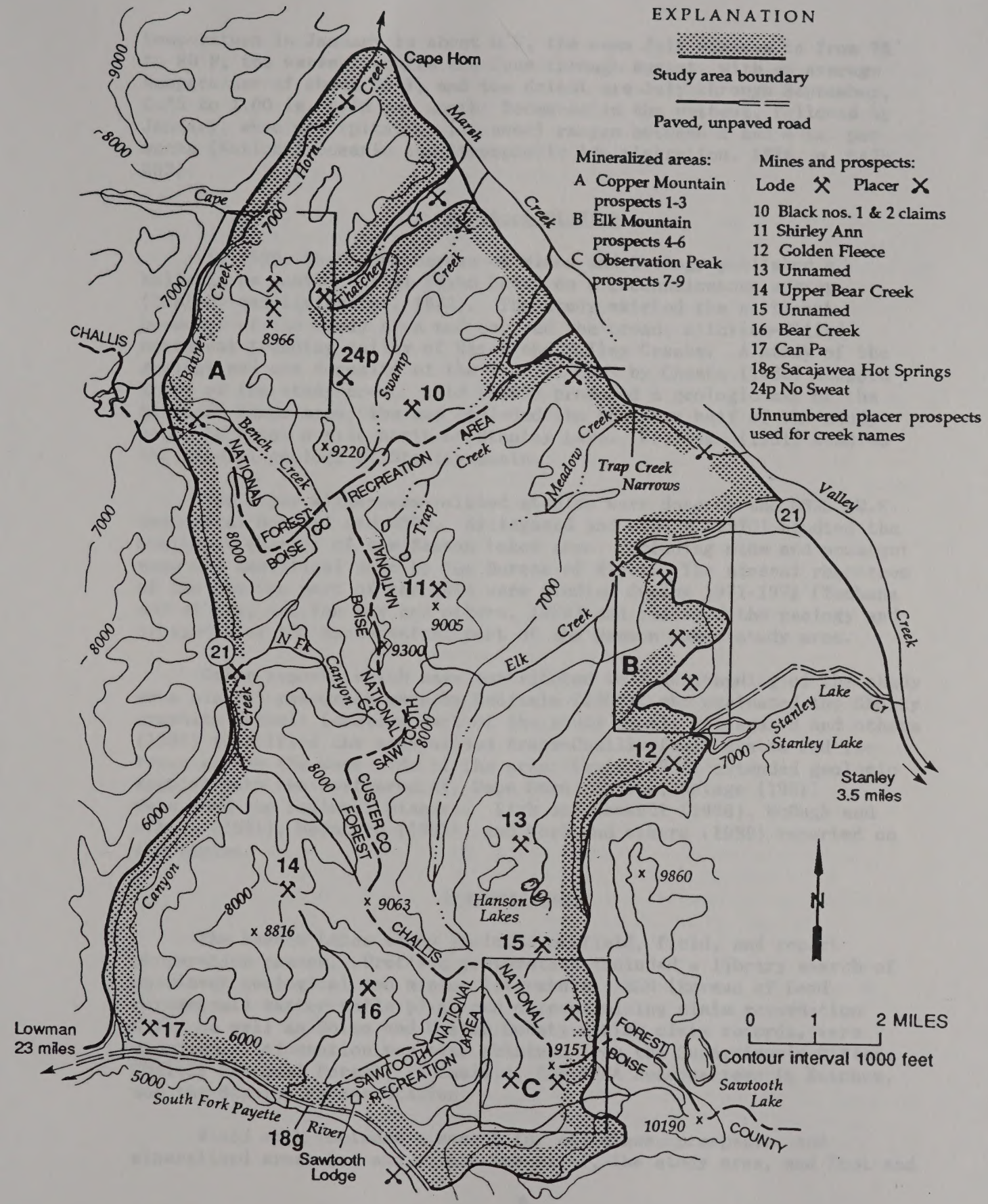
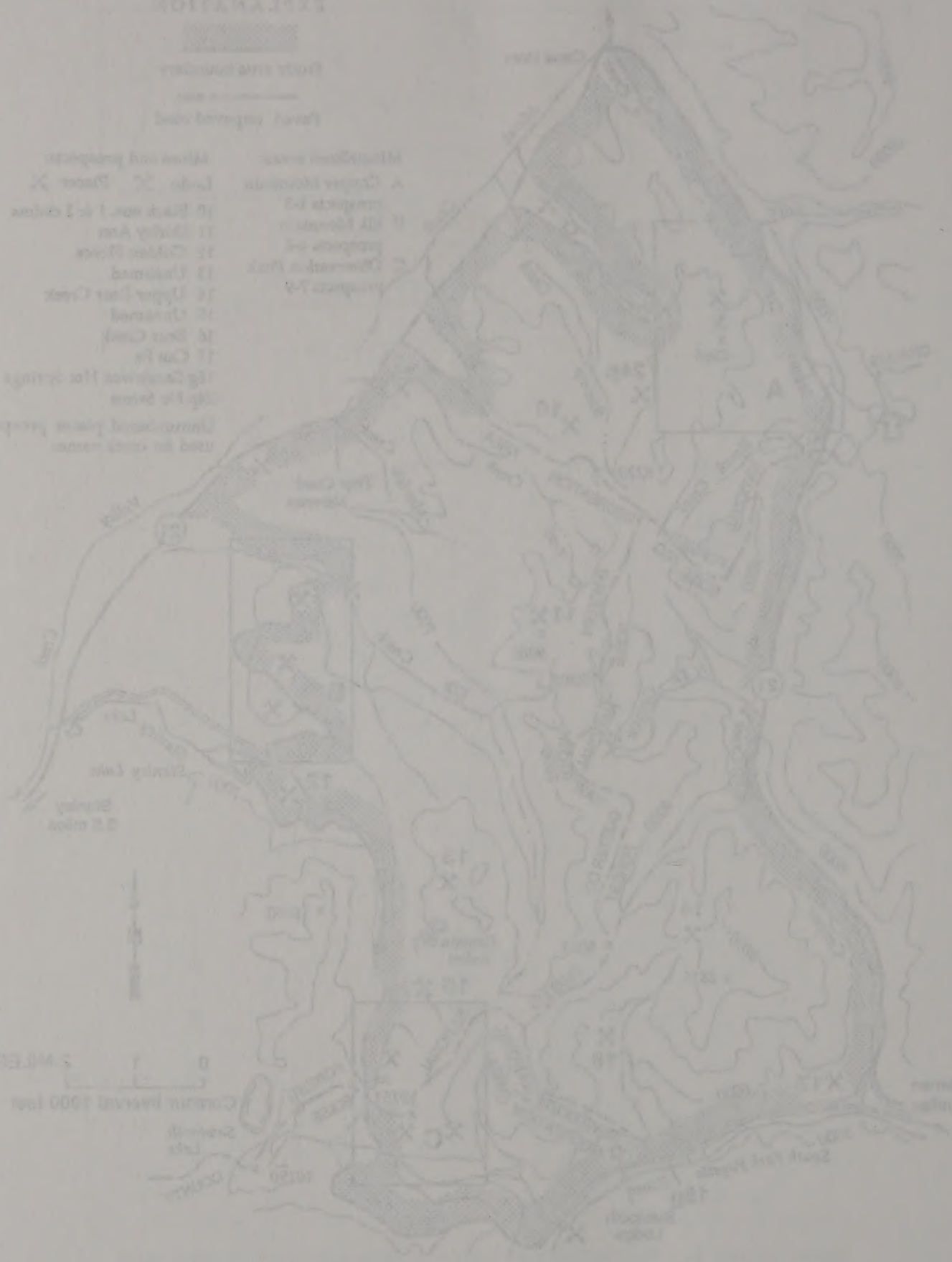


Figure 2.- Mineralized areas and miscellaneous prospects, Hanson Lakes study area



temperature in January is about 0°F, the mean July maximum is from 76° to 80°F; the warmest months are June through August, with an average temperature of about 60°F, and the driest are July through September, 0.25 to 1.00 in. rain per month; December is the wettest, followed by January, when precipitation (as snow) ranges between 2 and 4 in. per month (National Oceanic and Atmospheric Administration, 1974, p. 647-653).

Previous Studies

In 1920, the Idaho Bureau of Mines and Geology published a bulletin on south-central Idaho based on a reconnaissance survey (Umpleby and Livingston, 1920). The study skirted the northeast boundary of the study area and covered the broad, alluvium-filled northwest-trending valley of Marsh and Valley Creeks. A study of the geology and ore deposits of the Stanley area by Choate (1962) stopped short of the study area. Reid (1963) produced a geologic map of the Sawtooth Range area; the map included the southern half of the study area, to about a mile north of Stanley Lake. Williams (1961) studied the glacial geology of Stanley Basin.

Two major wilderness-related studies were done by the USGS (U.S. Geological Survey) and USBM. Kiilsgaard and others (1970) studied the southeast quarter of the Hanson Lakes area, including mine and prospect maps and analytical data by the Bureau of Mines. The mineral resources of the eastern part of the SNRA were studied during 1971-1972 (Tschanz and others, and Van Noy and others, 1986) and included the geology and prospects of the east-central part of the Hanson Lakes study area.

Other reports which have contributed to understanding of the study area mineral resources were by Benjamin (1983), who evaluated the Shorty graphite deposit (eastern part of the study area); Kiilsgaard and others (1986) identified the mineralized trans-Challis fault system and its trace across the west side of the area; Lewis (1984) extended geologic mapping into the northernmost, Cape Horn portion; Savage (1961) described the regional placers. Link and Hackett (1988), McHugh and others (1991), McIntyre (1985), and Worl and others (1989) reported on the region.

Present Study

The Hanson Lakes study included prefield, field, and report preparation phases. Prefield preparation included a library search of pertinent geological and mining literature. BLM (Bureau of Land Management) master title plats and current mining claim recordation data, as well as Boise and Custer County mining claim records, were examined. Information was also obtained from the Supervisor's Office, Challis National Forest, in Challis, the SNRA headquarters in Ketchum, and the Stanley Ranger Station.

Field work included a search for all mines, prospects, and mineralized areas in, and within one mi of, the study area, and foot and

helicopter reconnaissance. Mineralized areas and prospects were mapped and sampled; underground workings were mapped at waist height, except as noted. Several mineral deposits in the region were visited as possible analogue models to prospects in the study area, including the Cyprus Thompson Creek molybdenum mine, near Clayton, ID, the Sunbeam and Grouse Creek gold deposits, near Sunbeam, and the Bear Valley-Porter mine REE (rare earth elements) placer deposits north of Lowman (fig. 1).

A total of 327 samples were taken: 245 rock samples were from disseminated and lode-type mineralized areas and prospects; 77 alluvial samples included 30 from lode prospects (8 pan concentrate and 22 stream sediment), and 47 were from placer prospects. Alluvial sample types included: stream sediment -- an unconcentrated grab sample sieved to segregate a -200 mesh fraction, which was geochemically analyzed; reconnaissance pan -- mainly four 14-in. level pansful (0.016 yd^3) of alluvium partially concentrated in the field; reconnaissance sluice -- generally a 0.1-yd^3 sample concentrated on a 3-ft-long portable sluice box, or 0.275 yd^3 taken from a hand-dug pit; and a channel sample, an interval of stratified material from a trench. Rock sample types include: chip -- a line of chips taken across structures such as faults, foliation, joint sets, and veins; random chip -- taken at random intervals from homogeneous outcrops; grab -- float (loose rock) taken randomly from the soil cover or dumps at workings; and select chip and select grab -- pieces chosen from the most mineralized parts of an outcrop or rock pile.

Partially field-concentrated alluvial samples were checked for fluorescence and radioactivity, further concentrated on a laboratory-sized Wilfley table, and examined for free gold and other heavy minerals. The samples were split; free gold was hand picked from one split, which was then amalgamated to extract fine gold. The second split, along with stream sediment and rock samples, was sent to IGAL, Inc., Cheney, WA for geochemical analysis. Digestion for trace-element analysis was by Aqua Regia; sample splits prepared for whole rock analysis were fused with lithium tetra and meta borate at 1000^0 C.

Rock and alluvial samples were geochemically analyzed for Au (gold) by fire assay-AA (atomic absorption). Concentrations of Ag (silver), Cu (copper):, Pb (lead), Zn (zinc), Mn (manganese), La (lanthanum), Ce (cerium), and Y (yttrium) were determined by AA; As (arsenic) and Sb (antimony) were by organic extraction; and W (tungsten), Ba (barium), Mo (molybdenum), and REE were by ICP (inductively coupled plasma-emission spectroscopy). REE analyzed were La (lanthanum), Ce (cerium) and Y (yttrium). Whole-rock analysis was for major rock-forming elements by AA, except Ca (calcium), Mg (magnesium), and Ti (titanium) were by ICP; concentrations were converted to percent of equivalent oxide.

Analytical results for selected metal concentrations from Tertiary granite and rhyolite were contoured to visualize metal distribution. Isocons were defined by the kriging method (Bridges, 1985), and all

isocons were smoothed using Golden Software's SURFER software on a Microsoft-DOS-based desktop computer.

ACKNOWLEDGEMENTS

The authors would like to thank Joel Olson, owner of the Stanley Ace prospect, Kay and Louis Piva, owners of the Blue Jay prospect, and Art Niece and Fred Proctor, owners of the Passover prospect, for valuable information on the Hanson Lakes study area. Martin G. Cole, Geologist and Ore Control Engineer, Cyprus Minerals Company, Clayton, ID, showed USBM personnel the Thompson Creek molybdenum mine, and Russell Wood, P.E., Consultant, Apple Valley, CA, showed us his Bear Valley (ID) rare earth placer claims. Eberhardt Schmidt, Consulting Geologist, Spokane, WA, also provided information. Virginia B. Platt, Bowling Green State University, OH, provided insight into western mining history.

James (Jeff) J. Jones, Forest Service Geologist with the Sawtooth National Recreation Area (SNRA), Ketchum, ID, provided access to a Forest Service evaluation report on the Payette placer deposit. Max E. Norris, Lands Forester, SNRA, Stanley Ranger Station, helped with logistical arrangements. Bill Savage, Minerals Technician, Challis National Forest, Challis, ID, provided USFS aerial photographs and logistical advice. Kate Johnson and Thor Kiilsgaard, Geologists, USGS, Spokane, WA, and Reed Lewis, Idaho Geological Survey, provided helpful and timely information.

Robert Jewett and Laura Westover, USBM, ably assisted the authors in the field; Steve Schmauch directed the placer crew, which also included Michael S. Johnson, Miriam McCulloch, and David Payne.

REGIONAL MINING HISTORY

Placer Deposits

In July, 1863, a prospecting party led by Captain John Stanley discovered placer gold in the drainage they named Stanley Basin (Wells, 1983, p. 52), which includes the east half of the study area, but they did not remain to work the discovery (Choate, 1962, p. 4). By 1869 the first rush of placer mining in Idaho had waned in Boise Basin, south of the study area, and miners spread northeast to Atlanta (fig. 1) and other areas including Stanley Basin.

A gold rush was sparked in Stanley Basin by a prospector named Robinson in the late 1860's and early 70's when he discovered gold on a Salmon River bar that still bears his name 20 mi east of Stanley, and by Nathan Smith's placer discoveries on Loon Creek, directly north of the basin, in August 1869 (Ross, 1963). The first mining claims in Stanley Basin were located by Lake and Moore on Spring Gulch, at the headwaters of Kelly-Basin Creek drainage, north of Stanley, in the late 1860's or early 70's (Choate, 1962, p. 109). About this time, in the northwestern part of the basin, placer mining activity began at Buckley Bar on

Stanley Creek, in the Valley Creek district which overlaps the northwestern boundary of the study area. By June 1, 1870, about thirty miners were working the placers in Stanley Basin, including Valley and Marsh Creeks between Stanley and Cape Horn, where work progressed slowly because of scarce water (Wells, 1983, p. 53). District gold production prior to 1904, primarily from Buckley Bar, probably exceeded $300,000 (at $20/oz) (Choate, 1962, p. 114).

Placer gold was discovered in the Yankee Fork district, in the northeastern part of Stanley Basin, in February, 1873; the first lode claim in the district was located in 1874. Most placer activity in the basin occurred in the 1870's and 1880's and the depression of the 1930's, but early production was probably exceeded by dredge and drag line operations in the Yankee Fork district between 1940 and 1952, when about $1.4 million in gold was produced (at $35/oz) (Choate, 1962, p. 4 and 107).

Heavy mineral (black sand) deposits in the region were investigated between 1950 and 1955 (Kline and others, 1953). These studies led to black sand production of Au (gold), Nb (niobium, also known as columbium), Ta (tantalum), U (uranium), and REE at the Porter mine in Bear Valley north of Lowman (fig. 1); similar black sands were found in the Hanson Lakes area during this study.

Lode Deposits

The best placer gold mines near the study area, which were relatively easy to find and mine, were found by the late 1870's. Attention turned to precious-metal lode mining and later, about 1900, to base-metal lodes. The General Custer lode, in the Yankee Fork district, probably produced more than $12 million in gold prior to 1905; mining yielded $500,000 in gold, silver, and copper between 1908 and 1914. The polymetallic Bayhorse district near Challis, and the Seafoam district 10 mi north of the study area, developed in the late 1870's and 1880's (Ross, 1930 and 1987). In 1883 and 1895, the Buckskin and Valley Creek lodes were discovered one and two miles north of the study area, respectively (fig. 1). U.S. Antimony Corp. did reclamation work at the Buckskin mine in 1990 and recovered gold at its flotation and vat-leach plant at Preacher's Cove on the Yankee Fork (Bill Savage, oral commun., USFS, 1990). Total recorded production from the Valley Creek district lode deposits was 5,284 tons of ore, which contained 1,583 oz of gold, 33,949 oz of silver, 2,053 lbs of copper and 73,050 lbs of lead (Van Noy and others, 1986, p. 365). No lode production has been reported for the study area.

Disseminated Deposits

Uranium claims were first located several miles northeast of Stanley in 1955. About 90% of 7,767 tons of oxide ore, at a grade of 0.18% U_3O_8, was produced through 1960 from bedded disseminations; other minor production (of pitchblende) was from veins (Choate, 1962, p. 40).

In the late 1970's AMOCO Minerals carried out extensive exploration for molybdenum in the region, which included locating a large block of about 200 claims over the Copper Mountain mineralized area in the Hanson Lakes study area. The program ended in the development of the Thompson Creek deposit near Clayton, one of four primary molybdenum mines in the United States. The mine now belongs to Cyprus Minerals, formerly an AMOCO subsidiary.

In the 1980's, the effects of deregulation of gold prices and application of heap-leach extraction technology gave rise to intense exploration for disseminated gold deposits. In 1990, Grouse Creek Mining Company, Stanley, ID, was doing pre-production development of two deposits, the Sunbeam and Grouse Creek (fig. 1). Gold mineralization occurs in Tertiary rhyolite of probable Eocene age (Allen and Moye, 1990). Similar rock underlies parts of the study area.

In 1972, the U.S. Congress created the Sawtooth National Recreation Area, Public Law 72-400, closing about 40% of the study area to new mineral entry (location of mining claims) (pl. 1 and fig. 2). The new land status also fostered mineral examinations by USFS geologists of actively held claims within the recreation area. The law proscribed that only claims economically viable at the time the SNRA was established were valid; the Forest Service examinations led to invalidation of many claims. The study area portion within the SNRA is treated in somewhat less detail in this report due to the no-mineral-entry status, and also because portions had been studied during earlier USBM investigations (Van Noy and others, 1986).

GEOLOGIC SETTING

Rock Types

The Hanson Lakes study area is mostly (about 80%) underlain by the Cretaceous-period Idaho batholith, which consists of several granitic plutons (fig. 3). Quartz monzonite and lesser granodiorite predominate. Lewis (1984) estimates pluton emplacement between 100 and 70Ma (million years before present). These rocks are generally white and coarse grained, commonly contain pink feldspar phenocrysts, and are locally cut by felsite and pegmatite dikes, which appear to predate Eocene-age granite and rhyolite, discussed below. The quartz monzonite is subfoliate to foliate, northeast-trending, and commonly intruded into and intercalated with, Paleozoic-age metasediments (not shown at fig. 3 scale). The metasediments include thinly foliated hornblende biotite gneiss, biotite quartzite, and carbonate rock. Locally, small pegmatite bodies are several feet, to tens of feet wide, commonly contain both pink and white feldspars, and are generally conformable to foliation.

The oldest rocks in the study area, restricted in occurrence but which may be economically important, are sericite and biotite schist and biotite graphite schist (metasediments) underlying the east half of Elk Mountain, along the east-central boundary of the study area. These rocks are similar to the Precambrian-age Thompson Peak Formation of Reid

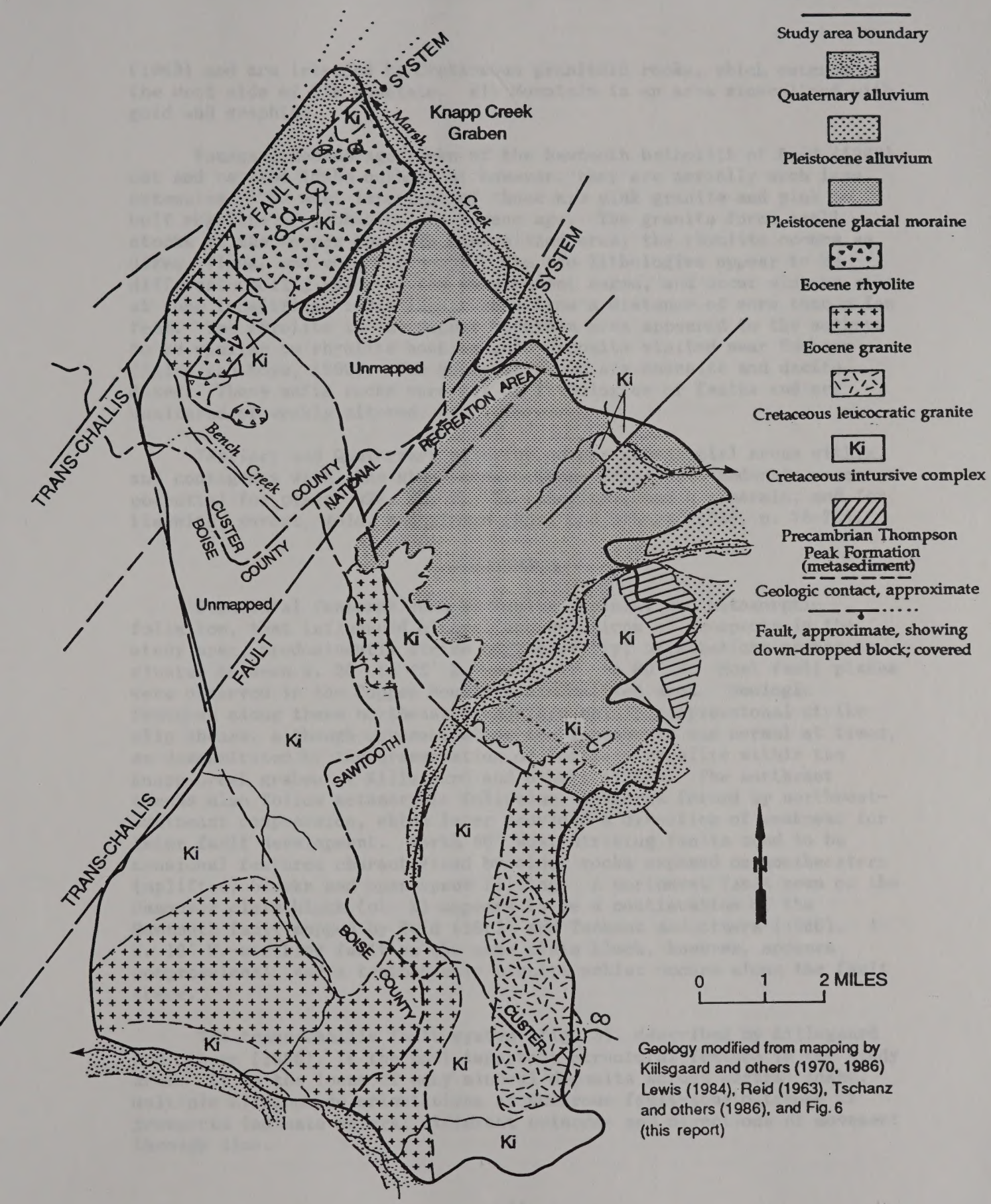
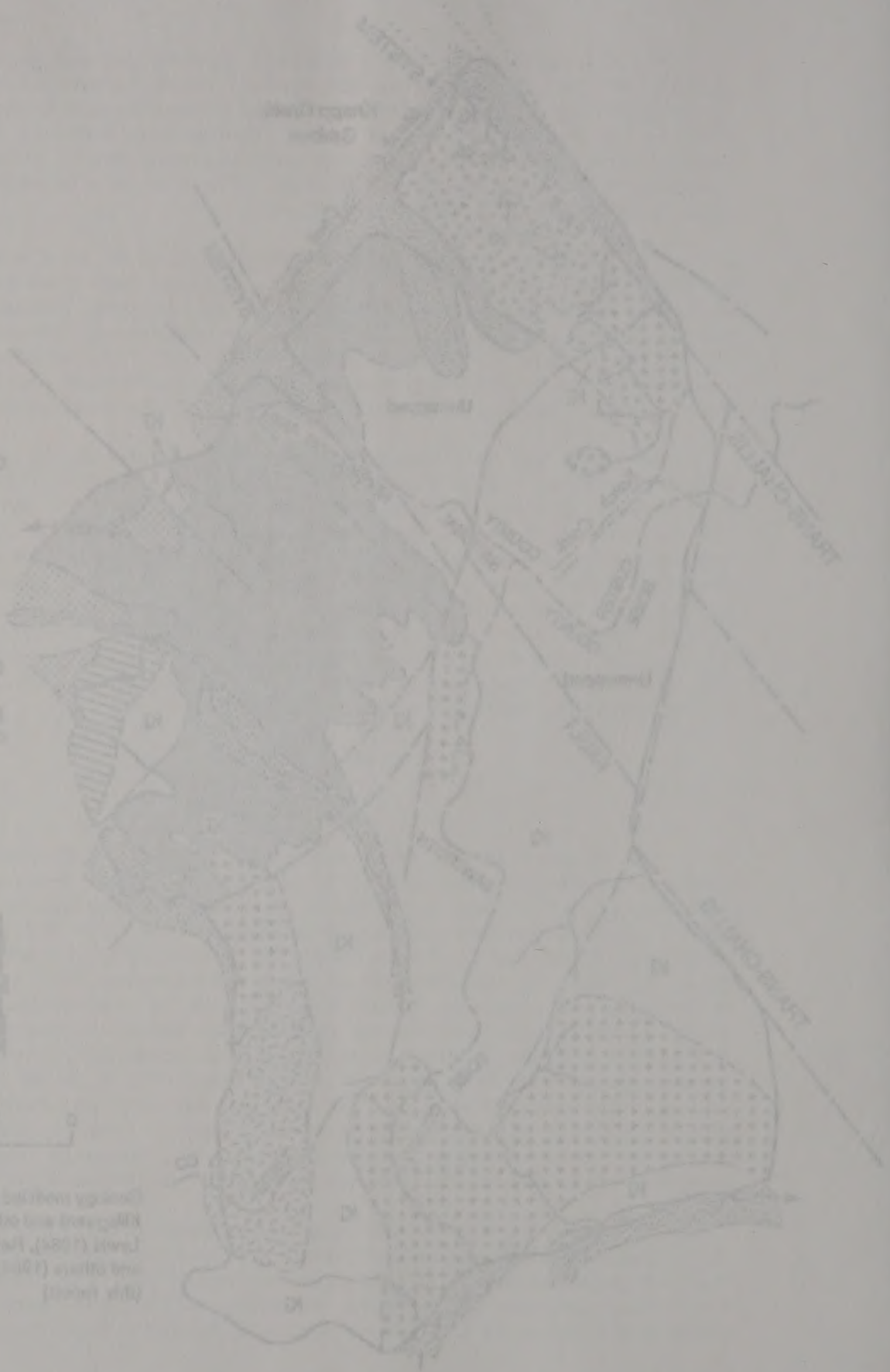


Figure 3.- Geologic map of the Hanson Lakes study area



(1963) and are intruded by Cretaceous granitoid rocks, which outcrop on the west side of Elk Mountain. Elk Mountain is an area mineralized with gold and graphite.

Younger, Eocene-age rocks of the Sawtooth batholith of Reid (1963) cut and cap the Idaho batholith; however, they are aerially much less extensive. The most important of these are pink granite and pink to buff rhyolite of probable late Eocene age. The granite forms small stocks in the Copper Mountain mineralized area; the rhyolite occurs as dikes, flows, and volcanic vents. The two lithologies appear to be different cooling rates of the same parent magma, and occur side by side at some localities, indistinguishable from a distance of more than a few feet. The rhyolite in the Copper Mountain area appeared to the authors to be similar to rhyolite hosting gold deposits visited near Sunbeam (Allen and Moye, 1990). The youngest rocks are andesite and dacite dikes. These mafic rocks were cut by lithologies or faults and are unaltered or weakly altered.

Tertiary and Quaternary alluvium covers substantial areas within, and contiguous with, the study area. These areas have moderate resource potential for placer REE, Nb, Ta, Th (thorium), and U minerals, and for ilmenite, garnet, gold, and zircon (Worl and others, 1989, p. 76-78).

Structure

Structural features such as faults, joints, and metamorphic foliation, that influenced mineral accumulations at prospects in the study area, predominantly strike northeasterly; orientations appear to cluster between N. 20° to 45° E. and N. 75° to 80° E. Most fault planes were observed in the Copper Mountain mineralized area. Geologic features along these northeast trends are mainly compressional strike-slip shears, although movement along the lineaments was normal at times, as demonstrated by the preservation of Tertiary rhyolite within the Knapp Creek graben of Kiilsgaard and others (1986). The northeast trends also follow metamorphic foliation, features formed by northwest-southeast compression, which later provided a direction of weakness for later fault development. North 60° west-striking faults tend to be tensional features characterized by older rocks exposed on southwestern (uplifted) blocks and open-space filling. A northwest fault seen on the Passover claim block (pl. 2) appears to be a continuation of the Sawtooth fault mapped by Reid (1963) and Tschanz and others (1986). A N. 10° W.-striking fault on the same claim block, however, appears compressional, and a tectonogenic biotite schist occurs along the fault trace.

The trans-Challis fault system (fig. 3), described by Kiilsgaard and others (1986), is the most important structural feature in the study area. It is the locus of many mineral deposits across central Idaho. Multiple slickenside orientations at numerous fault-zone outcrops at prospects indicate several different episodes and directions of movement through time.

COPPER MOUNTAIN MINERALIZED AREA

Mining History

The Copper Mountain mineralized area (fig. 4) consists of three "modern" claim groups, which date back over the last two decades, and several more inactive "historic" prospects. Only the modern claim groups, Ida, Passover, and Blue Jay are enumerated on plate 1. The Ida group (abandoned) was co-extensive with the mineralized area. The Passover claim block (pl. 2 and fig. 4, large inset) was first located as a group of five claims by J. H. Neilson in 1939 (table A-4, part 1). Ken Lee relocated a larger block over historic claims, retaining the Passover name, about 1969, which he held until his death in 1985 (Fred Proctor, 1991, oral commun.). Fred Proctor, Boise, and Art Niece, of Clayton, ID, relocated the Passover as a block of 36 claims, which they currently (1991) hold. The Blue Jay prospect (fig. 4, small inset; figs. 13 and 14) was relocated in 1965 by Louis and Kay Piva, Challis, ID, and is currently held.

Interest in the Copper Mountain area dates back to the turn of the century, when base-metal deposits in the region became economically important with development of railroad infrastructure. County court house records indicate intermittent activity at least through 1956 (table A-4). Insufficient geographic descriptions precluded plotting exact historic claim locations, but they undoubtedly clustered around the several workings on the mountain at small, high-grade skarn- and vein-type lodes.

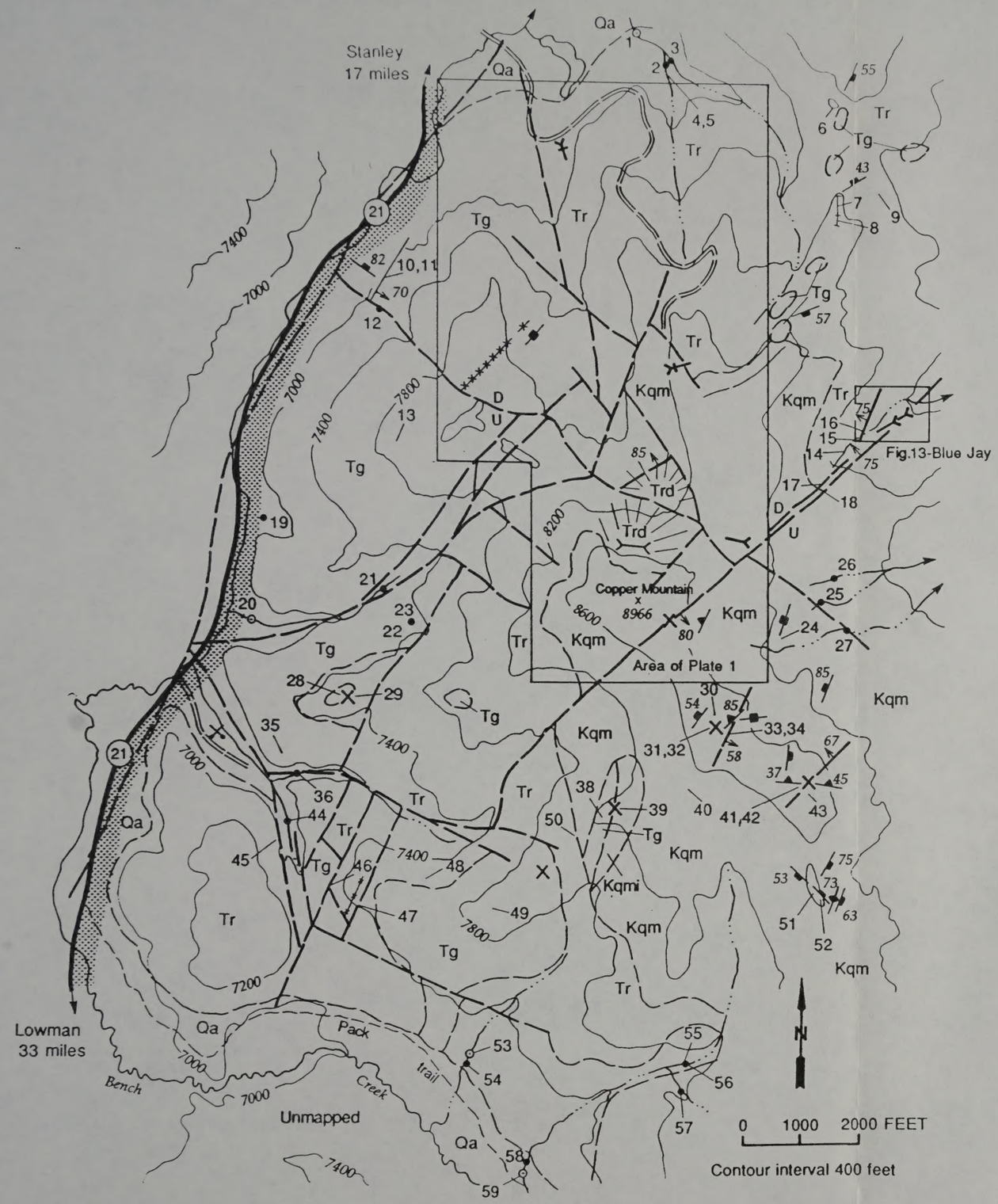
BLM mining claim recordation data shows AMOCO Minerals staked the large Ida group (fig. 4) at Copper Mountain, between 1979 and 1982. AMOCO's target was a large disseminated, or "porphyry" type, molybdenum deposit, but almost no work was done on the prospect (Eberhardt Schmidt, oral commun., 1990).

Geology

Rocks and Structures

The Copper Mountain mineralized area lies between two main boundary faults, that delineate the trace of the trans-Challis fault system across the study area, and which also delineate the northwest and southeast sides of the Knapp Creek graben (figs. 2 and 3). The mineralized area is composed of numerous broken fault blocks (fig. 4). Several N. 60° W.-striking faults cross the graben; these blocks commonly appear to be uplifted south of the faults, and downdropped to the north, suggesting a series of south-tilting blocks within the graben.

A N. 60° W.-striking fault crosses the north face of Copper Mountain, may be an extension of the Sawtooth range-front fault (fig. 3), and is the locus of a red rhyolite dome (fig 5.; table A-1, no. 129). Cretaceous batholithic rocks are on top of the mountain south of



EXPLANATION

Study area boundary

Highway; gravel road; trail

Qa — Quaternary alluvium

Tertiary mafic dike

Tr — Trd — Tertiary rhyolite, rhyolite dome

Tg — Tertiary granite

Kqm — Cretaceous quartz monzonite (Kqmi-iron-stained quartz monzonite) and lesser metasediment

Geologic contact

70 D / U — Approximate fault, showing dip (U-up, D-down)

80 70 — Foliation and jointing; showing dip, vertical

Adit, caved adit

Trench

X — Pit

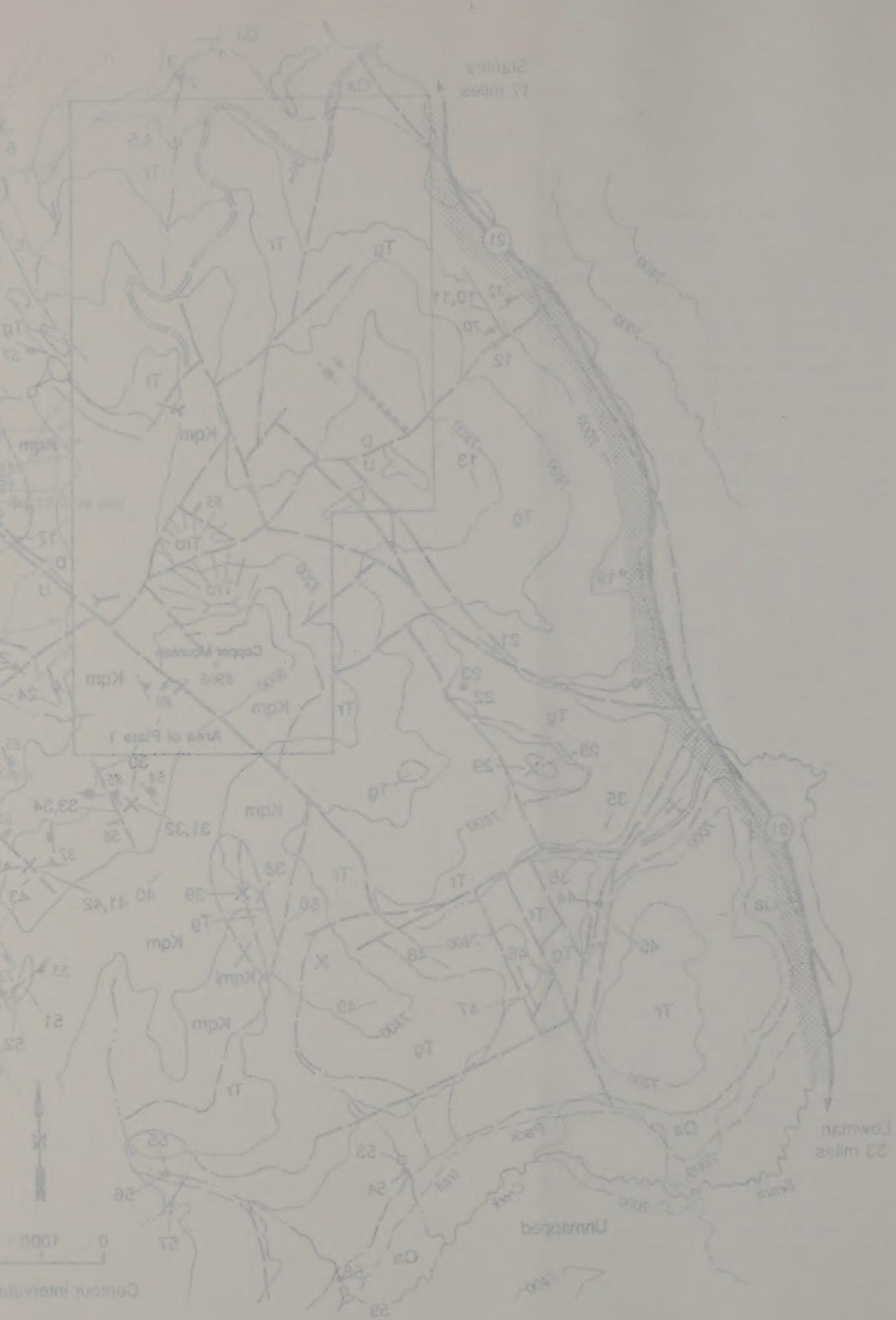
X — Gravel pit

7 — Rock sample locality, showing trace

8 — Stream sample locality

9 — Pan concentrate sample locality

Figure 4.- Sample localities and reconnaissance geology in the Copper Mountain mineralized area (approximate area of Ida claim group)



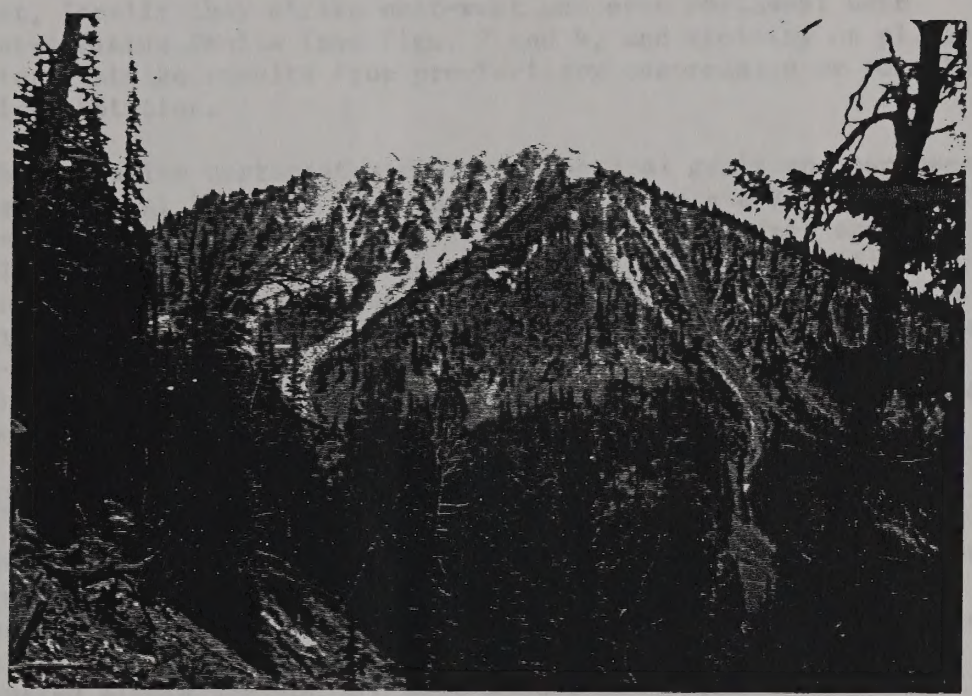


Figure 5.--North face of Copper Mountain

the fault, and younger rhyolite occurs at lower elevation to the northeast. The fault trace contains open-space-filled quartz veinlets (table A-1, no. 103). A common intrusive form of Tertiary rhyolite are dikes, which cut Cretaceous plutons and enclosed metasediments (pl. 2, nos. 90 and 120; figs. 6 and 7, no. 158).

Small, locally mineralized metasediment enclosures are common within the Cretaceous quartz monzonite (fig. 4), where they compose 30 to 40 percent of the rock and locally form lit-par-lit gneiss (pl. 2 and fig. 8; nos. 118-120). Although the metasediments generally strike northeast, locally they strike east-west and even northwest near northwest-striking faults (see figs. 7 and 9, and vicinity on pl. 2). The easterly strike results from pre-Tertiary compression or possibly later block rotation.

The pervasive northeast-striking structural grain and northwest-striking tensional features seen on figure 4 and plate 2 are reflected at large scale at the small adit (fig. 10), the north face open-cut (figs. 11 and 12), and at the Blue Jay adits (figs. 13 and 14). An additional structural feature seen in the middle Blue Jay adit is a horizontal fault, represented by a flat back (ceiling) with slickensides and a 2-in.-thick gouge zone along the top of the rib (wall). This may represent a northwesterly compressional or detachment event and post dates both skarn and shear zone mineralization.

Mineralization

Evidence for three types of mineralization occur in the Copper Mountain area: skarn (tactite) and vein lodes, and disseminated occurrences. Skarn and vein mineralization are relatively high grade and contain readily visible metallic sulfide minerals. Signs of disseminated mineralization are more subtle and require more attention to rock alteration and geochemistry. These types of occurrences represent three separate mineralizing episodes, skarn mineralization during the Cretaceous, and shear zone and epithermal disseminated mineralization during the Tertiary.

Skarn Occurrences

Skarn (tactite) mineralization zones occur in the study area between intrusive contacts and carbonate-rich metasediments, a result of heat and fluids associated with the intrusion. In some places, however, tactite zones in carbonate rocks may be tens of feet from the intrusive heat source. Tactite zones in the study area are characterized by garnet, epidote, and various calc-silicate (calcium-rich silicate) minerals. Metallic sulfide minerals observed include pyrite, galena, sphalerite, chalcopyrite, arsenopyrite, and very fine-grained dull sectile sulfides, which appear to be argentite and chalcopyrite. Malachite commonly occurs with the fine sulfides.

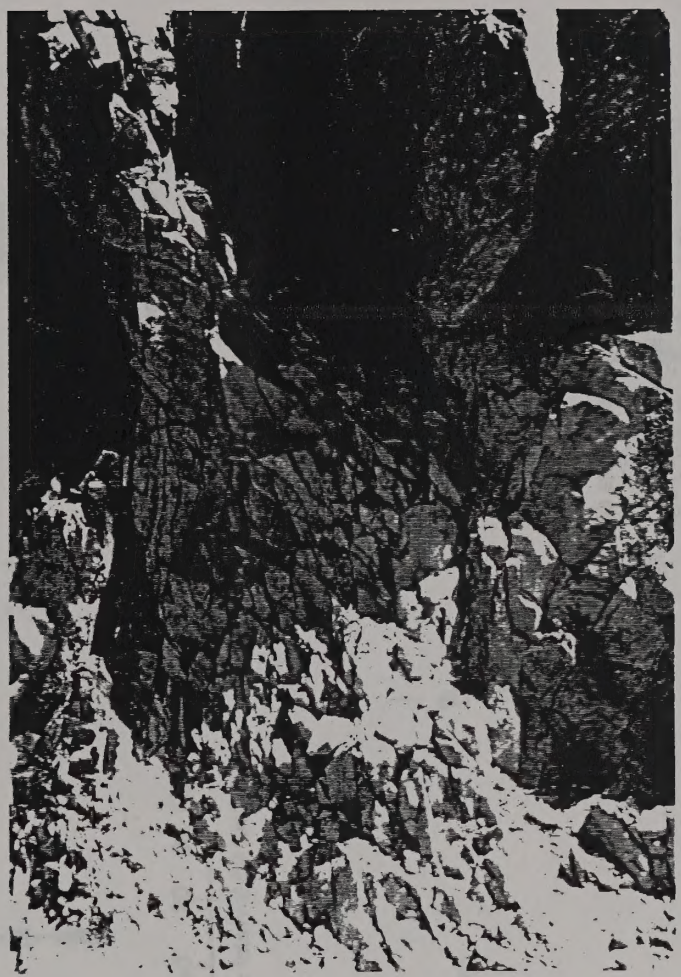
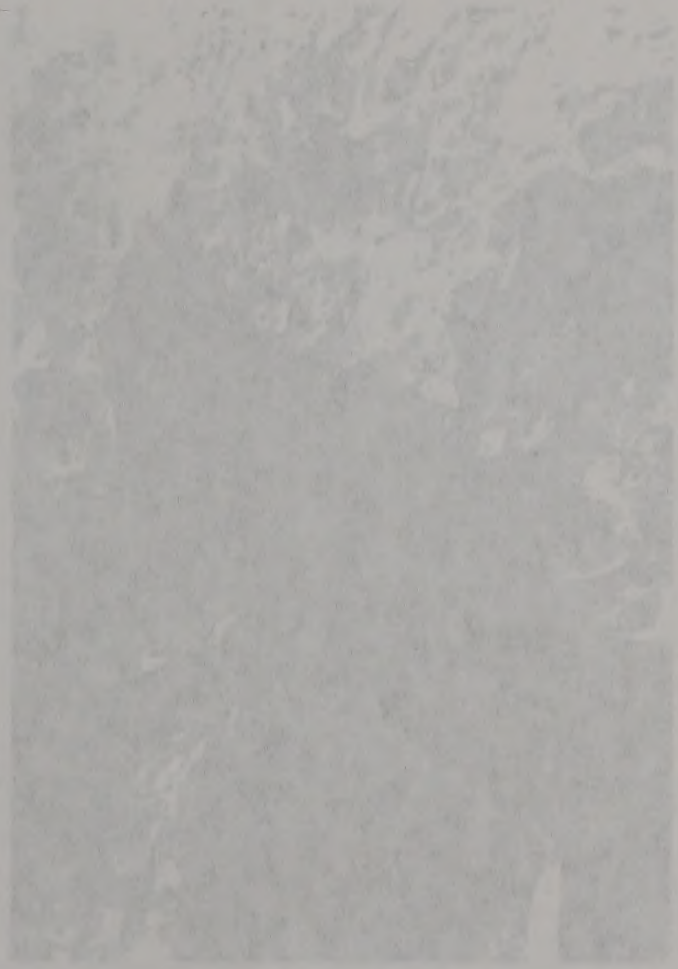


Figure 6.--Biotite gneiss (metasediment) intruded by rhyolite dike (samples nos. 89 and 90), Passover claim group



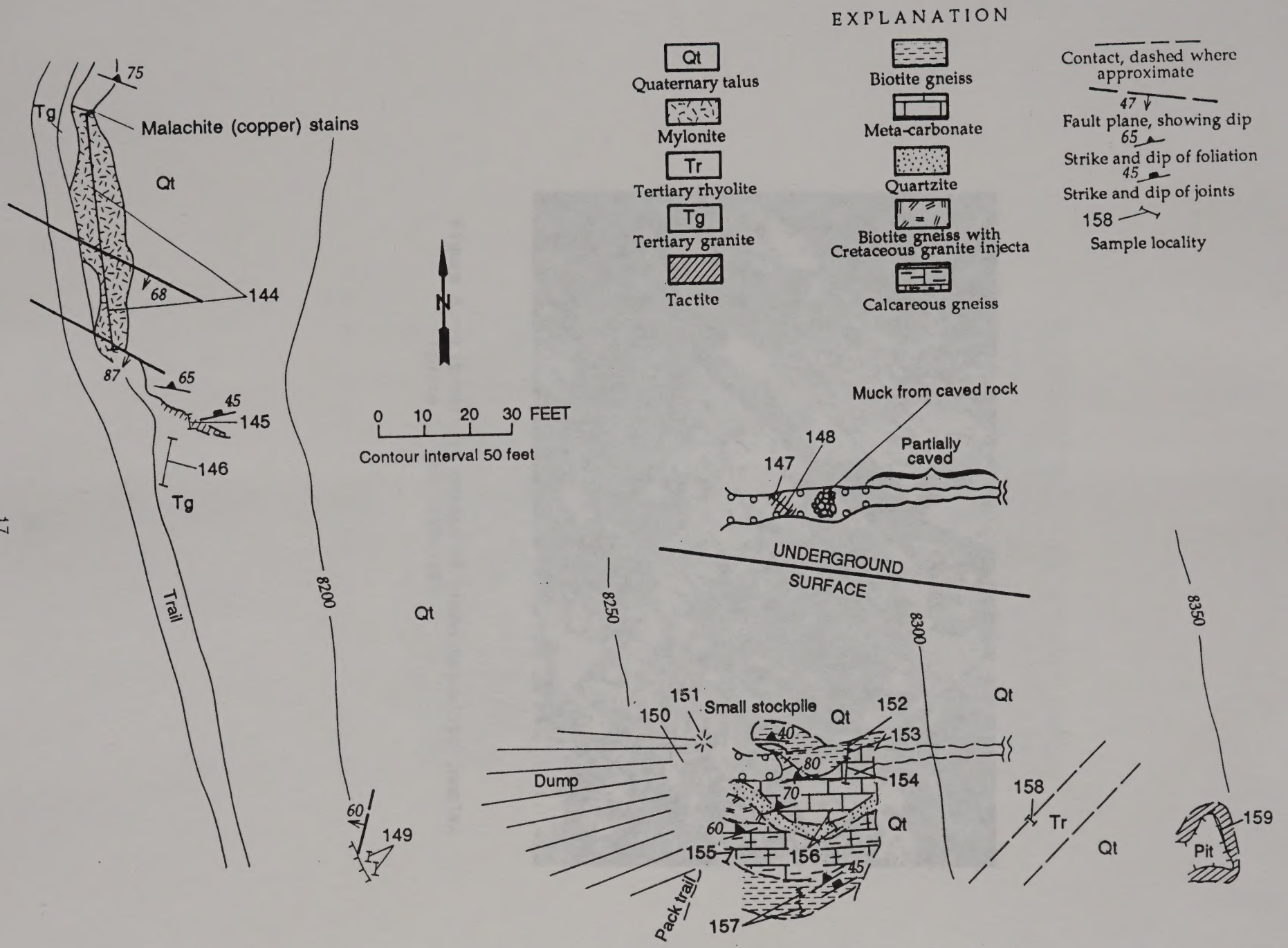


Figure 7.- Sample localities and geology in the upper caved adit area, Passover claim group

Figure 8.--Lit-par-lit gneiss of Idaho batholith complex (plate 1, nos. 117-119)

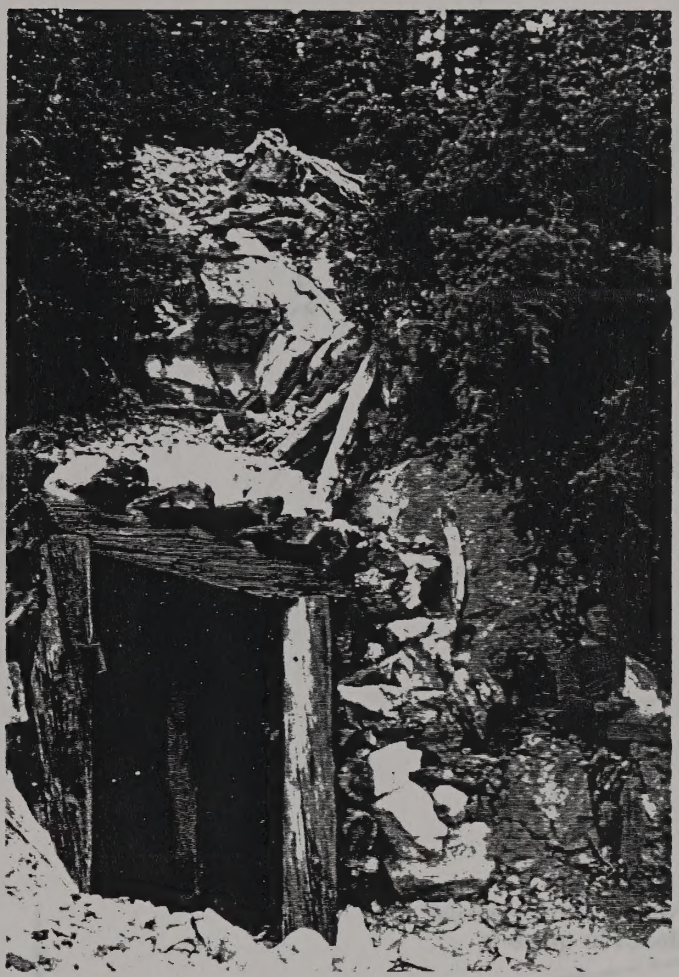


Figure 9.--Upper caved adit, Passover claim group

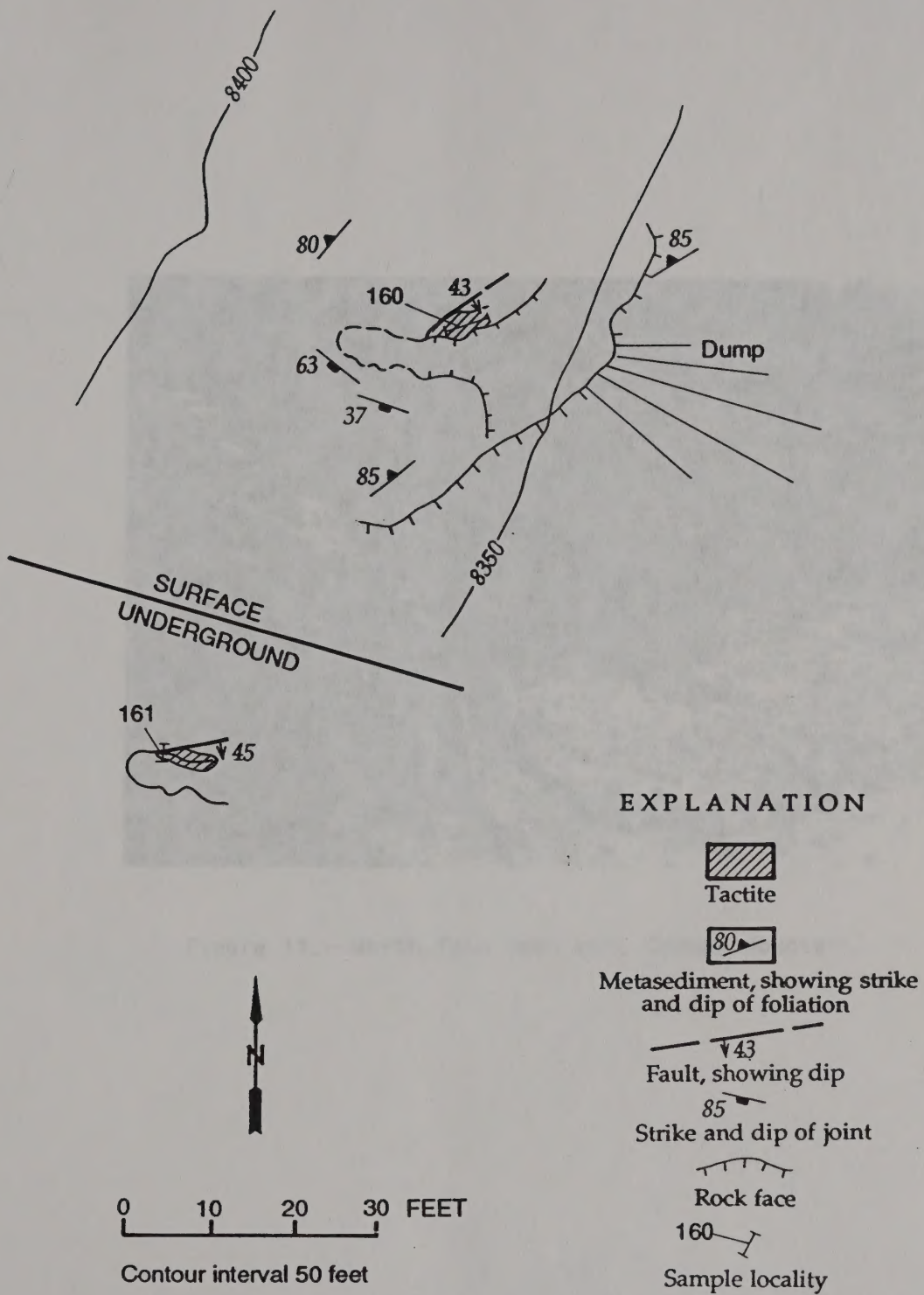
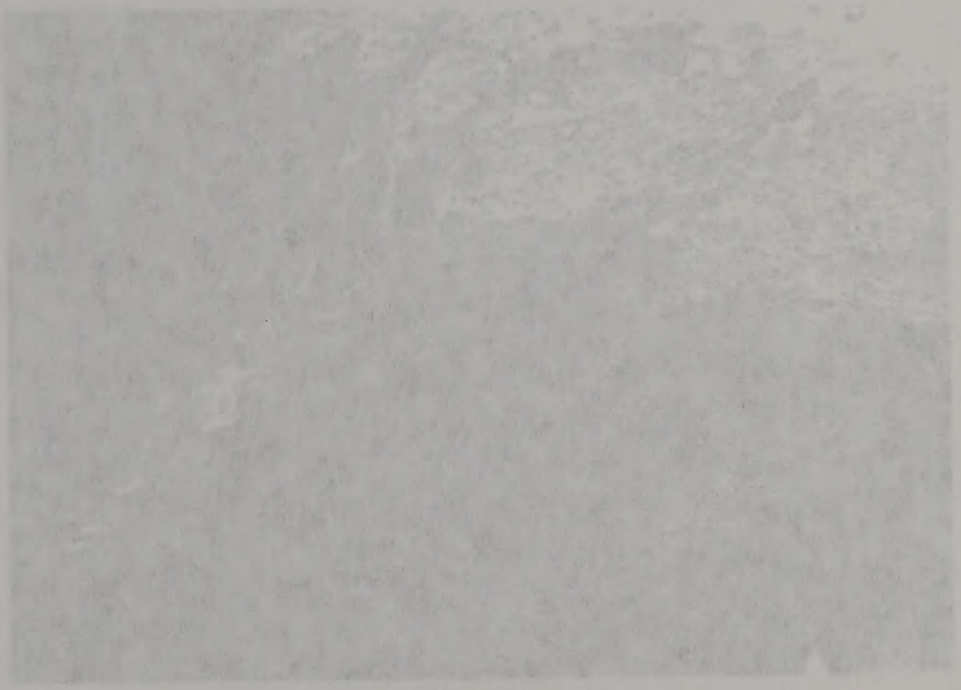


Figure 10.- Sample localities and geology at the small adit, Passover claim group

Figure 11.--North face open cut, Copper Mountain



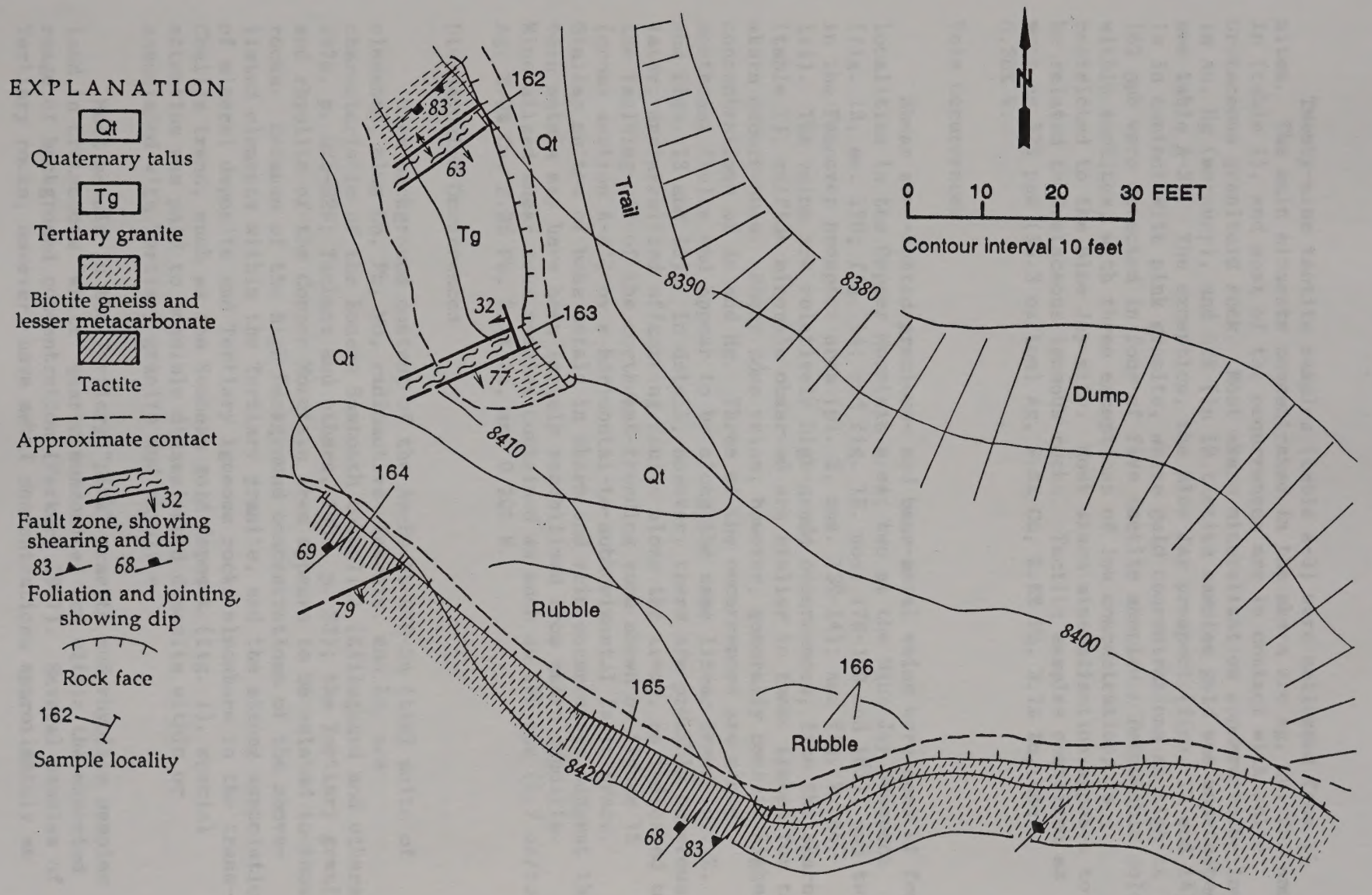


Figure 12.- Sample localities and geology at the north face open cut, Passover claim group

Twenty-nine tactite samples (table A-3) were collected from 11 sites. The main elements concentrated in the skarn are Ag, Cu, Pb, and Zn (table 1), and most of the occurrences are in contact with white Cretaceous granitoid rock. Most skarn mineralization appears to be low in Au, Hg (mercury), and REE (in 19 tactite samples gold was undetected, see table A-3). The exception, the Blue Jay prospect (figs. 13 and 14), is in contact with pink granite, where gold concentrations as high as 162 ppb were detected in four of five tactite samples. Detectable gold within tactites, with three exceptions of low concentration, is restricted to the Blue Jay site. Most skarn mineralization appears to be related to Cretaceous igneous rocks. Tactite samples contained as much as 525 ppm (15.3 oz/ton) Ag, 9.5% Cu, 2.6% Pb, 3.7% Zn, and 0.20% W.

Vein Occurrences

Shear zone-hosted precious- and base-metal veins were seen at four localities in the Copper Mountain area; two at the Blue Jay prospect (fig. 13, no. 170; fig. 14; and fig. 15, nos. 178-180 and 183), and two in the Passover prospect area (pl. 2, nos. 139-141; and fig. 7, no. 144). The veins are relatively high-grade occurrences, like the skarns (table 1); sulfide minerals observed are similar to those listed for the skarn occurrences. Shear zone veins, however, generally contain higher concentrations of Au and Hg. Three of the occurrences are along northeast faults and appear to be along the same linear trend (pl. 2, and figs. 13 and 15). In detail, however, there are probably numerous later, unmineralized offsetting faults along the trend, as indicated by the faulting-off of the northeast-trending zone shown on figure 15 (cross section A-A') by a horizontal-to-subhorizontal fault trace. Similar suites of base metals in skarn and vein occurrences suggest the vein metals may have been largely remobilized from skarn deposits. Mineralized shear zone samples contained as much as 195 ppm (5.7 oz/ton) Ag, 2.0% Cu, 2.3% Pb, 3.7% Zn, and 0.20% W.

Disseminated Occurrences

High background content of the Au-Be-Nb-REE-Sn (tin) suite of elements, plus Cu, Pb, Mo, radioactive elements, and Zn, are characteristic of the Eocene Sawtooth batholith (Kiilsgaard and others, 1970, p. D25-D26; Tschanz and others, 1986, p. 33); the Tertiary granite and rhyolite of the Copper Mountain area appears to be related to those rocks. Because of the high background concentrations of the above-listed elements within the Tertiary granite, and the strong association of mineral deposits and Tertiary igneous rocks elsewhere in the trans-Challis trend, such as the Sunbeam gold deposit (fig. 1), special attention was paid to possible disseminated deposits within or associated with Tertiary granite and rhyolite.

Most metals in the Tertiary "pink" granite and rhyolite samples (and in Cretaceous "white" quartz monzonite) are within the expected range of background concentration (Parker, 1967). Several samples of Tertiary rocks, however, have metal concentrations approximately an

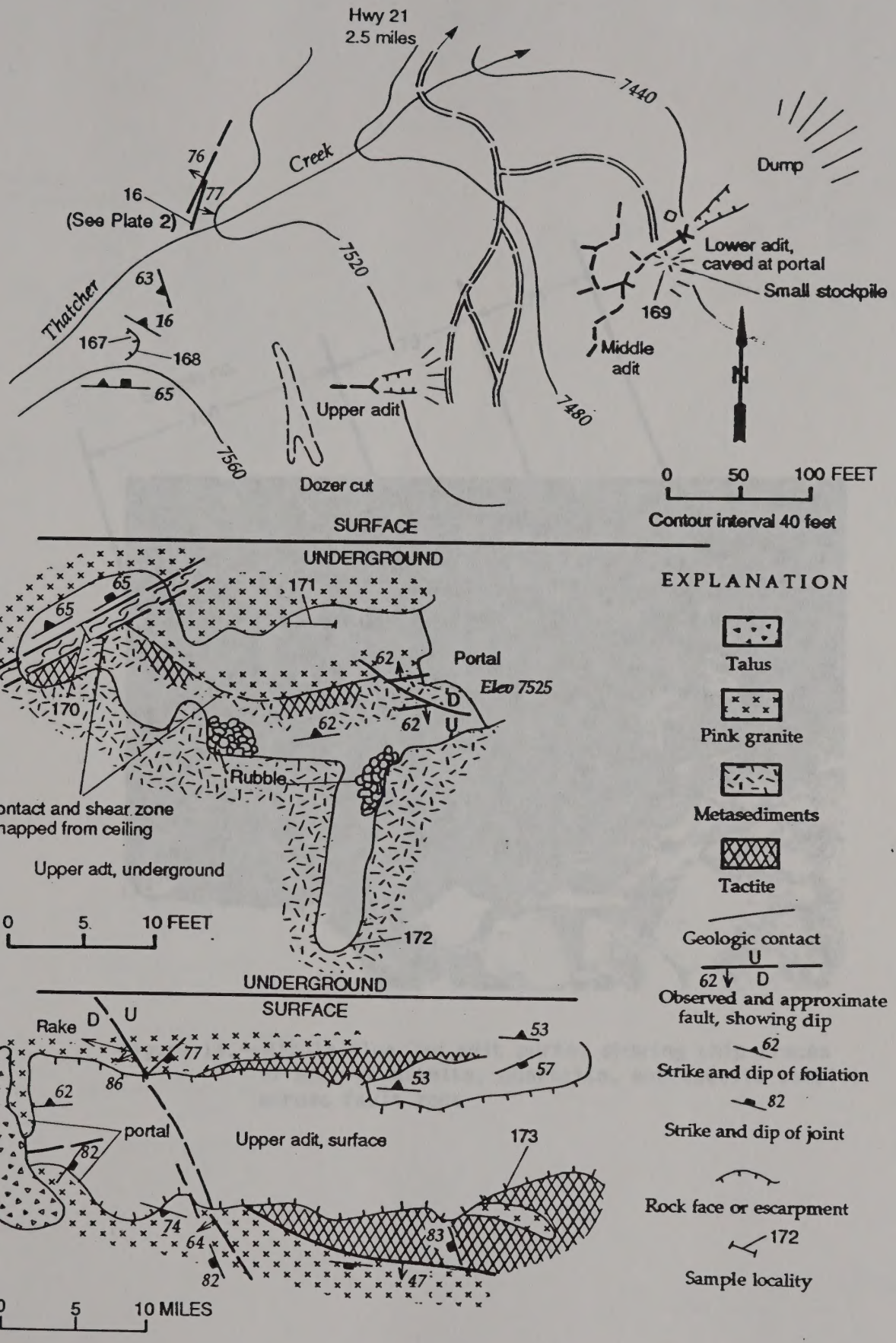
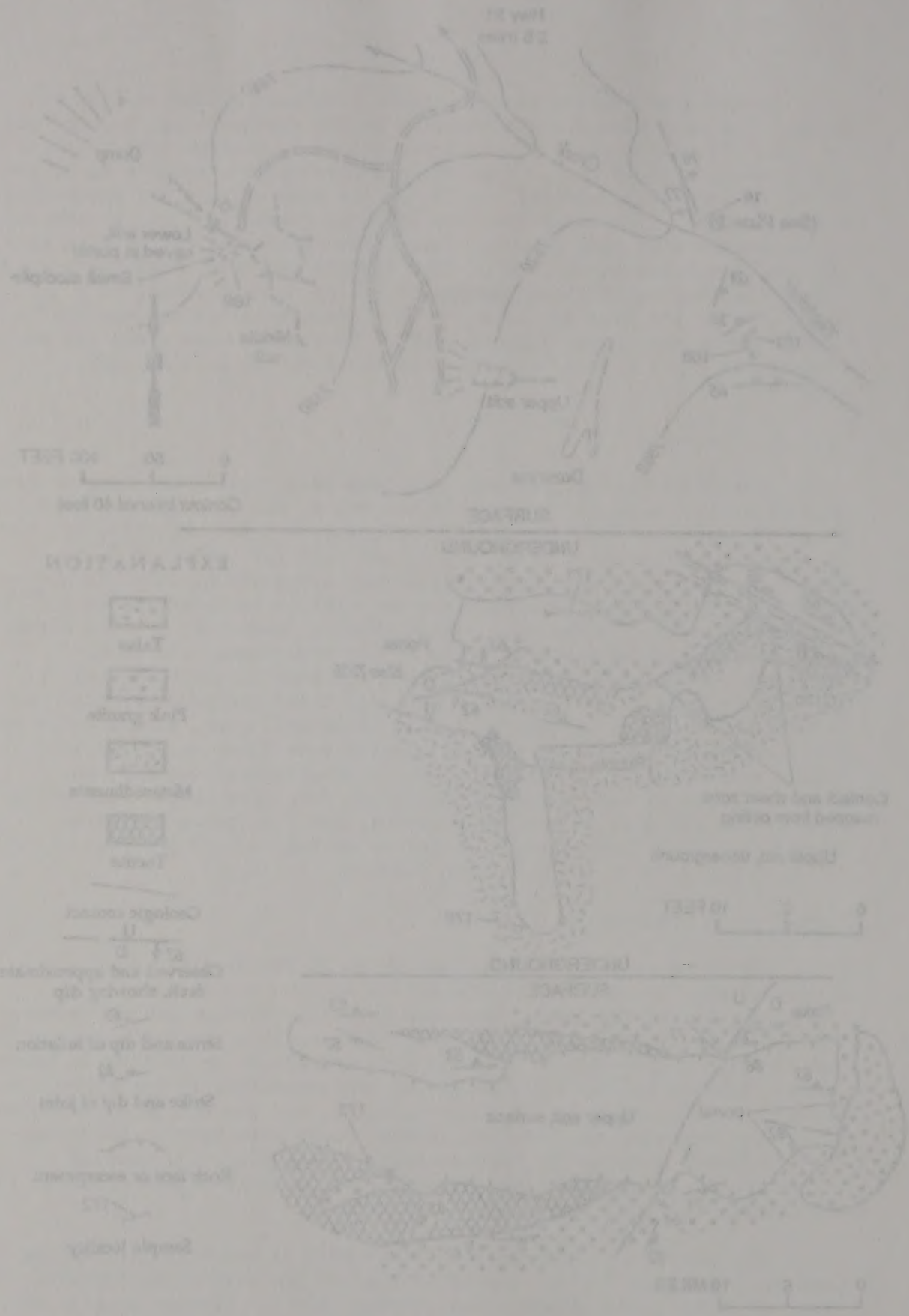


Figure 13.- Sample localities and geology on the surface and in the upper adit, Blue Jay prospect



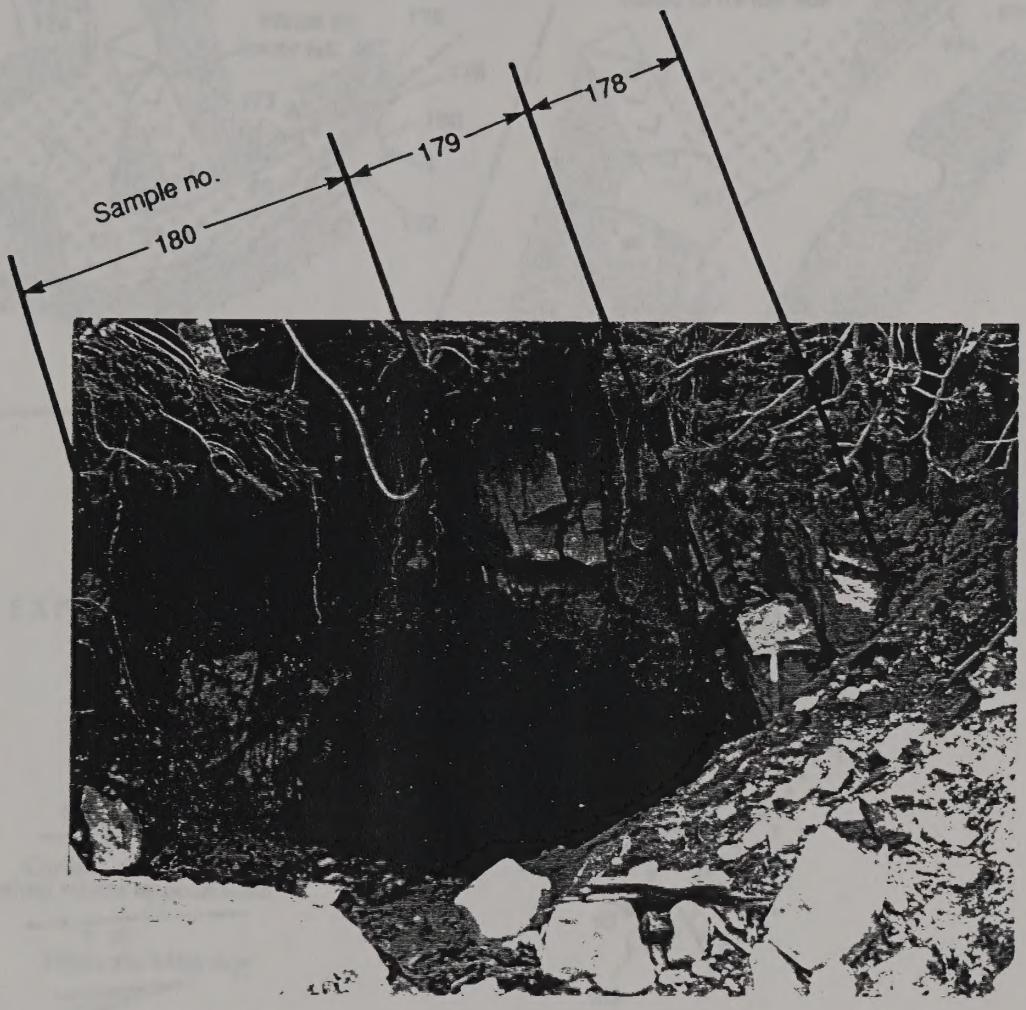
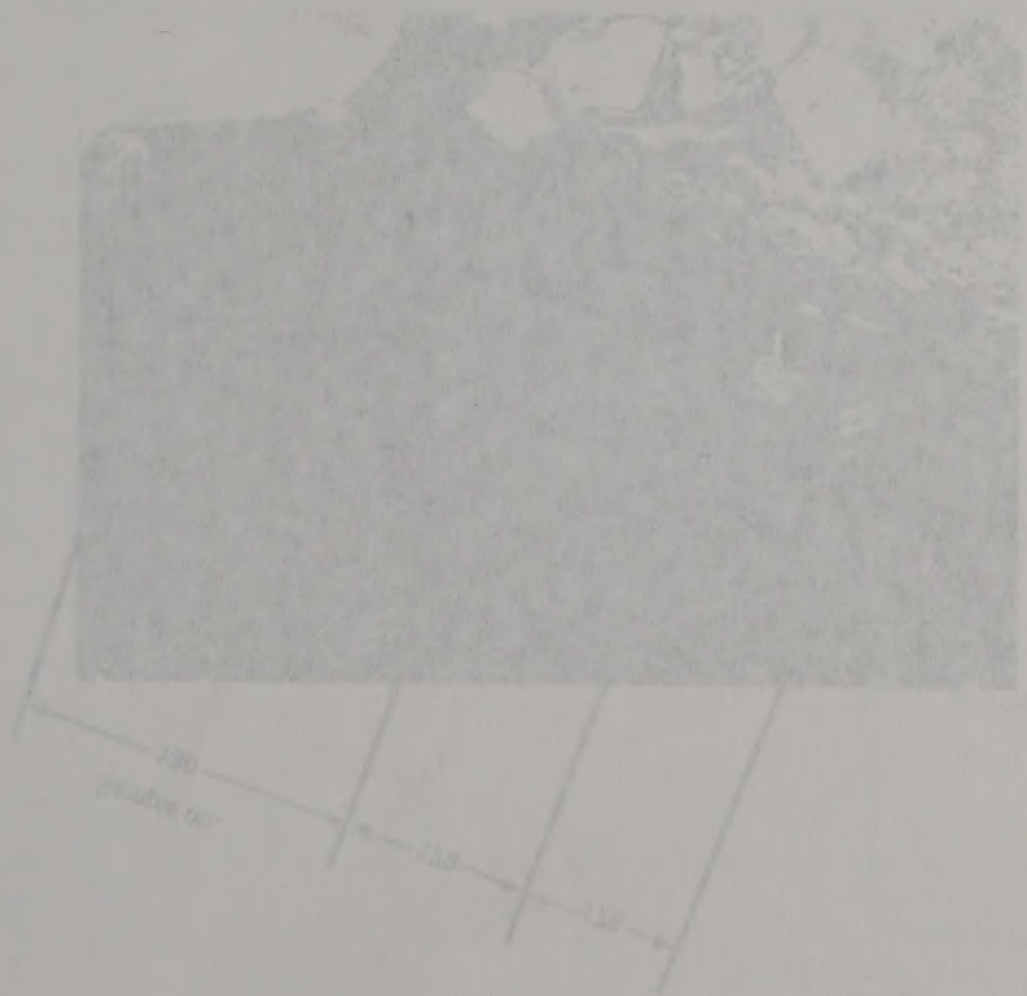


Figure 14.--Middle Blue Jay adit portal showing chip traces of sheared granite, quartzite, and tactite samples across fault zone



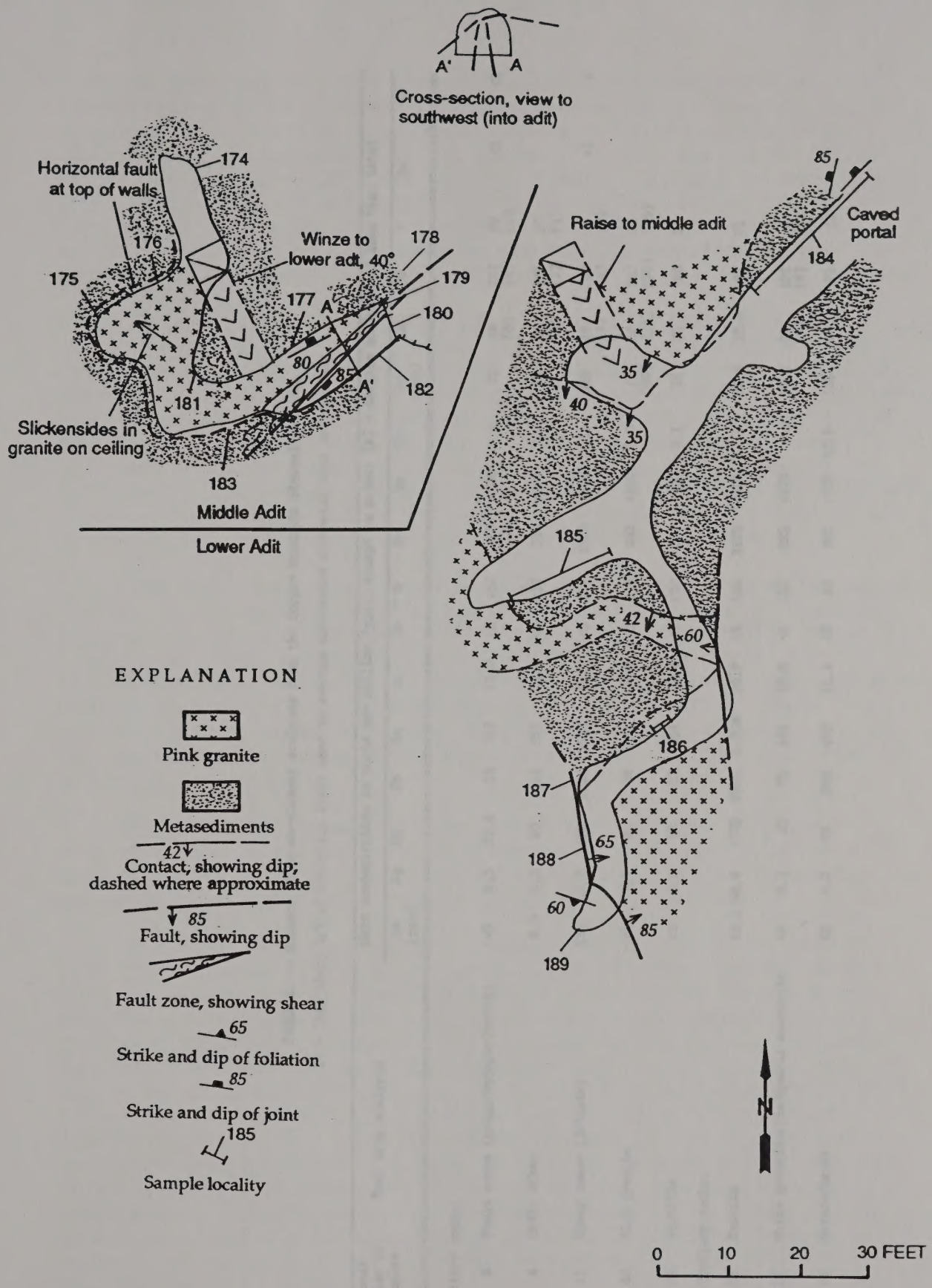


Figure 15.- Sample localities and geology at the middle and lower adits, Blue Jay prospect

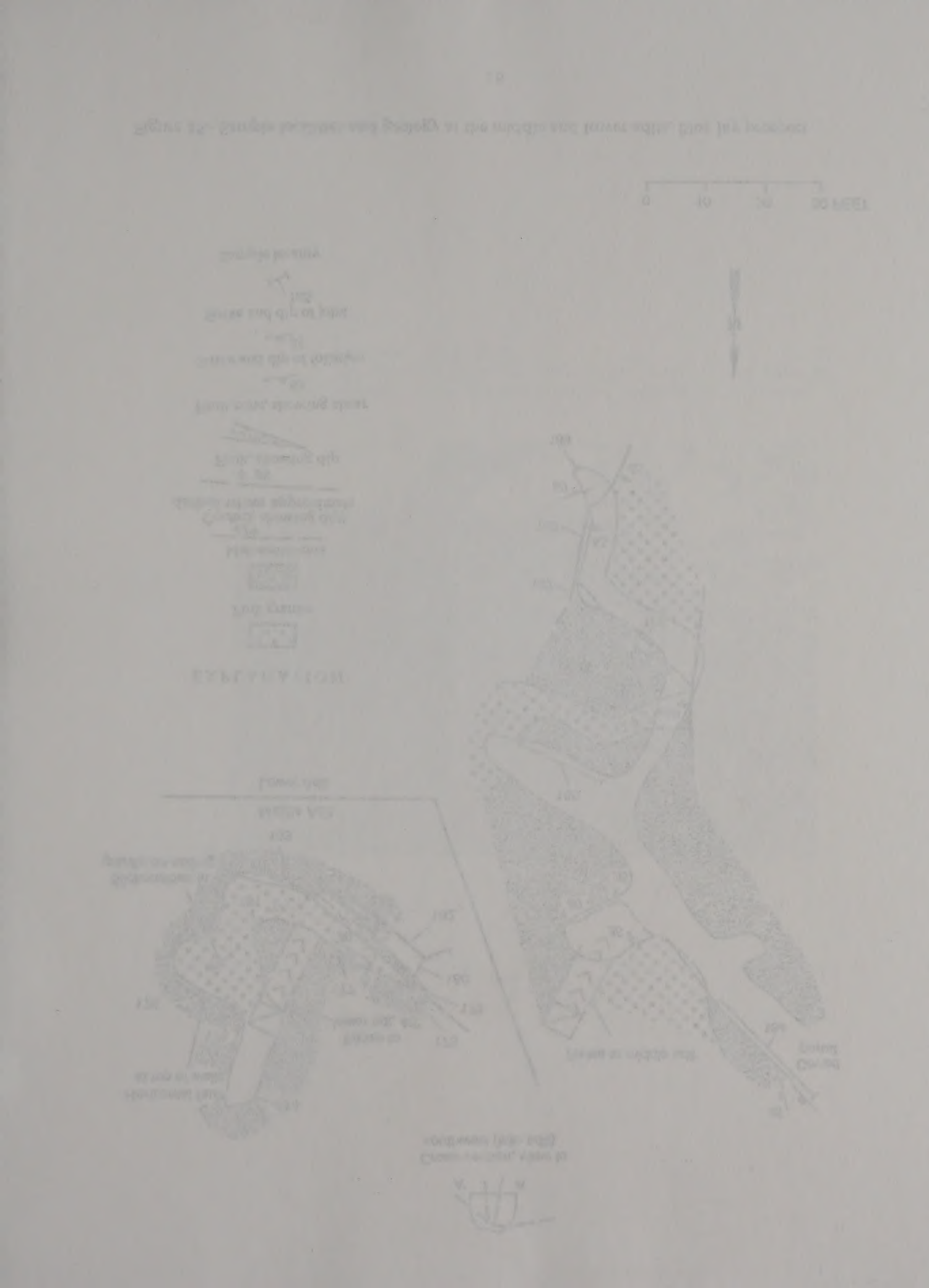


TABLE 1. -- Summary of trace-element analyses from the Copper Mountain mineralized area

[< - less than; 1/2 of detection limit used to average undetected elements; data are rounded]

Total number of samples	Rock type analyzed	Mean concentration in parts per million (ppm), except as noted; [x] - samples analyzed if less than total																
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
Tertiary rocks:																		
8	Fault zones (gouge/vein/mylonite)	<5	0.3	23.4	19	267	12.9	<5	<10	380	<100	1	31	46 [6]	117 [6]	26 [6]	<1	<1
4	Mafic dikes	6.3	0.3	90	14	227	6.4	<5	<10	616	<100	2.5	10	45 [1]	115 [1]	20 [1]		
11	Shear zones (foliate)	132	55.3	1498	1024	1837	18.7	<5	351	1720	<100	11	393	16 [4]	32 [4]	10 [4]	<1	1
40	Pink granite	<5	0.7	21	36	101	5.4	<5	<10	333	<100	3.0	15 [39]	56 [25]	143 [25]	19 [25]		
34	Rhyolite	<5	0.5	19	37	104	7.4	<5	<10	154	<100	3.1	21	33	88	30		
pre-Tertiary rocks:																		
29	Tactite	19.2	59.4	7775	7406	1.73%	10.2	<5	410	3123	<100	11.6	62.6	23.4	62	21		
14	White granodiorite/quartz monzonite	<5	0.3	31	61	168	10.8	<5	<10	222	<100	3.2	10.4	39 [9]	102 [9]	9 [9]		
28	Metasediment	<5	1.3	76	206	402	11.4	<5	33	755	<100	10.5	138	27	71	16		

order of magnitude higher or lower than the background (average) concentrations shown on table 1, indicating epigenetic mineralizing processes have occurred. The twelve panels on plate 3 depict areal distribution of concentrations, as isocons, for six metals, Au, Pb, As, Mo, Hg, and Ce, in granite and rhyolite samples; the plate corresponds with figure 4 in area and scale. There is evidence for at least three mineralized localities within the granite, including one along the north-central boundary of the mapped mineralized area, one at the center, and one in the southwest corner.

The north-central anomalous site is based on analyses of four "pink" granite samples (60, 62, 64, and 65) and on observed alteration (pl. 2, panels 1-4, 9; tables A-1 and A-3). Only samples 62 and 64 had elevated Au levels (45 and 10 ppb) but no. 60 had high Pb (280 ppm), and nos. 60 and 62-64 contained relatively high Zn and Hg. Sample 64 from the lower caved adit contained weak Au (10 ppb), Ag (14 ppm), and Pb (135 ppm) anomalies, and a stronger Mo (21 ppm) anomaly, relative to background. The sample anomalous in Mo came from deeper in the Tertiary pluton. Mineralization does not appear to extend into the rhyolite (pl. 2, panels 5-8, 10) and may have predated rhyolite extrusion.

The central anomalous site is based on analysis of granite sample 107 (pl. 2; table A-3), which registered an anomalously high concentration of the REE, La (235 ppm), Ce (605 ppm), and Y (135 ppm), and of Mn (1,805 ppm). REE concentrations are not indicated in the N. 60° W.-striking tension fault (sample locality 104); hence, mineralization may predate this structure. Granite sample 73, from north of sample locality 107, is anomalously low in all trace metals, especially in REE; low concentrations can signal a local area of metal depletion caused by secondary processes.

The southwest anomalous site is based on analyses of granite samples 28 and 29 and on observed alteration (pl.3; fig.4; tables A-1 and A-3). Sample 28 contained elevated concentrations of Mo and Hg, and sample 29 contained concentrations of Au, As, Mo, and Hg.

One other granite anomaly is represented by sample 171 (pl. 3; fig. 13; tables A-1 and A-3), which contains elevated Ag, Pb, and Zn; these concentrations are probably related to intrusive contact with tactite at the Blue Jay workings, rather than later mineralization. Two, weak Hg concentrations occur in granite outcrops along the north face of Copper Mountain (sample localities 113 and 130), and a very strong Hg anomaly (6,875 ppb), relative to other concentrations in the mineralized area, occurs in a granite dike on top of the mountain (sample locality 138). The high Hg anomaly may be caused by a local concentration of cinnabar (mercury sulfide) or 'nugget effect' and may not be readily repeatable; the value was omitted from statistical computations. The Hg anomalies are not corroborated by corresponding anomalies of other metals, but are especially interesting because Hg is volatile at standard temperatures and pressures, and may indicate mineralization at depth.

There are fewer and generally weaker anomalies in the rhyolite than in the granite. A rhyolite sample (no. 7) was taken adjacent to a granite sample (no. 8); both have weak Hg concentrations (75 and 70 ppb). Sample 17 had elevated Pb (102 ppm), Mn (285 ppm), and Zn (180 ppm); sample 48 was high in Pb (202 ppm); sample 50 was high in Zn (778 ppm); sample 127 was high in Pb (137 ppm) and Zn (277 ppm); and sample 128, from the rhyolite dome, was high in Hg (120 ppb). All these samples are adjacent to geologic contacts or faults. A stream sediment sample (no. 23) from granitic terrane, but mainly of rhyolitic sediment, contained anomalous metals, notably 40 ppm Mo.

Evaluation

No mineral resources have been identified in the Copper Mountain mineralized area. Undiscovered resources may be present given the favorable geologic setting within the trans-Challis fault system, and ample evidence of at least three types of mineralization.

Skarn Occurrences

Despite relatively high-grade skarn mineralization in the Copper Mountain area, economic development is unlikely because the deposits are small and discontinuous. Also, the mineralized metasediments are intertongued with granitic injecta, which dilutes the grade. Silver, the only precious metal present in significant concentration (as much as 525 ppm or 15.3 oz/ton), has dropped in price over the last several years, and averaged about $5 per troy ounce in 1990, a price similar to that in 1977-78, unadjusted for inflation. Maximum analyses for base-metal concentrations in skarn occurrences was 9.5% Cu, 2.6% Pb, 6% Zn, and 0.20% W. Although these combined metal concentrations would be mineable at many deposits, the small size of the skarn occurrences precludes development.

Vein Occurrences

The veins are apt to be more continuous than the tactites, but they are commonly faulted off and although they tend to contain more gold, ore grade concentrations required to mine the steeply dipping structures underground have yet to be discovered. Underground mining costs are generally over $100 per ton. These costs require an ore grade equivalent to about 0.25 oz/ton gold, or 8,500 ppb, at a $400 per ounce gold price, just to break even. Current economics make the mineralized area a more likely target for disseminated epithermal gold, or perhaps Be (beryllium), Nb, REE, or Sn (tin).

Disseminated Occurrences

Despite what appears to be promising terrane for disseminated epithermal mineral deposits in the Copper Mountain mineralized area, no conclusive evidence was found to indicate mineable grade occurrences.

Nevertheless, discovery of a low grade-large tonnage disseminated deposit of Au, Be (beryllium), Cu, Mo, Nb, REE, and Sn (tin), mineable by open-pit methods, is a possibility.

Recommendations

It may be worthwhile for more detailed exploration for disseminated deposits to be conducted in the Copper Mountain area; rock sampling by the USBM was only of a reconnaissance density. The rock sample localities (22 and 35) nearest the two mineralized samples (28 and 29) from the southwest mineralized site are 1,400 ft away, and the second nearest sample site is twice that. Metal concentrations in rock samples from disseminated gold deposits can vary greatly over a few feet. The north-central mineralized site is along the northern edge of the mapped area, and is open to the north.

ELK MOUNTAIN MINERALIZED AREA

Mining History

Mining claim records indicate prospecting activity on Elk Mountain (fig. 16) began with location of the Copper Jacket in the vicinity of the Stanley Ace in 1901 (table A-4, part 2). The Muggins was located on the north end of Elk Mountain in 1902, followed by the Elkida group of eight claims in 1905 and 1906. In 1917, the Molybdenum nos. 1 and 2 were located near the top of the mountain, a precursor to the Gold Coin located in 1922. The Gem State (5 claims) was located on the north end of the mountain in 1929 (Van Noy and others, 1986, p. 383), probably over the Elkida group.

The Elk Creek mine, three claims near creek level (Shorty prospect, fig. 17), was probably located about the same time. In 1942, Elk Creek Mining Company extended their adit 120 ft, for a total of 427 ft, and installed a 4 ft by 3 ft ball mill, small classifier, and three small flotation cells; the mill was later moved to the Valley Creek mine (Jack Niece, oral commun., 1991). That same year, Gem State Mining Company reported 20 ft of new workings for a total of 366 ft (Campbell, 1942, p. 109). All underground workings (eight adits) are now caved. The claims were primarily located for gold, but there was no confirmed production; the lower Gem State adit(s) were reported by Van Noy and others (1986) to have produced some silver, but the adits were caved prior to the 1971 field work.

The Shorty group (fig. 17) of 15 claims was located, for gold and silver, over the inactive Gem State and Elk Creek blocks, during the spring of 1968 by Jack and Ruth Niece. Mr. Niece discovered flake graphite in 1970, while dozing an access road to the precious-metal occurrences. In the early 1970's, the USBM, USGS, and Ophir Exploration Company (Colorado) did minor mapping and sampling work (Ridenour, 1976). In 1983, the USBM did further mapping and sampling and ran a EM-VLF (electromagnetic-very low frequency) survey. There has been no graphite

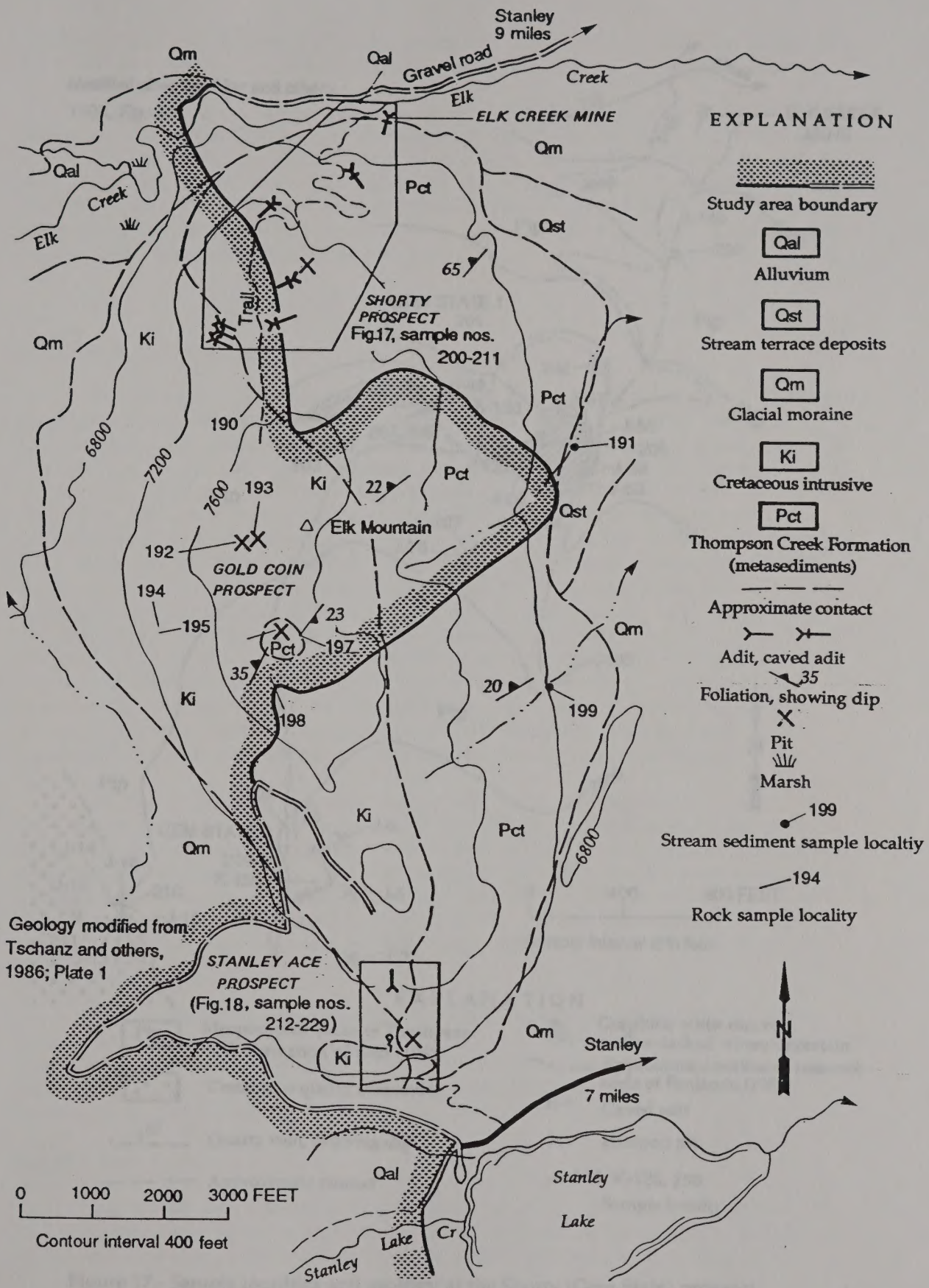
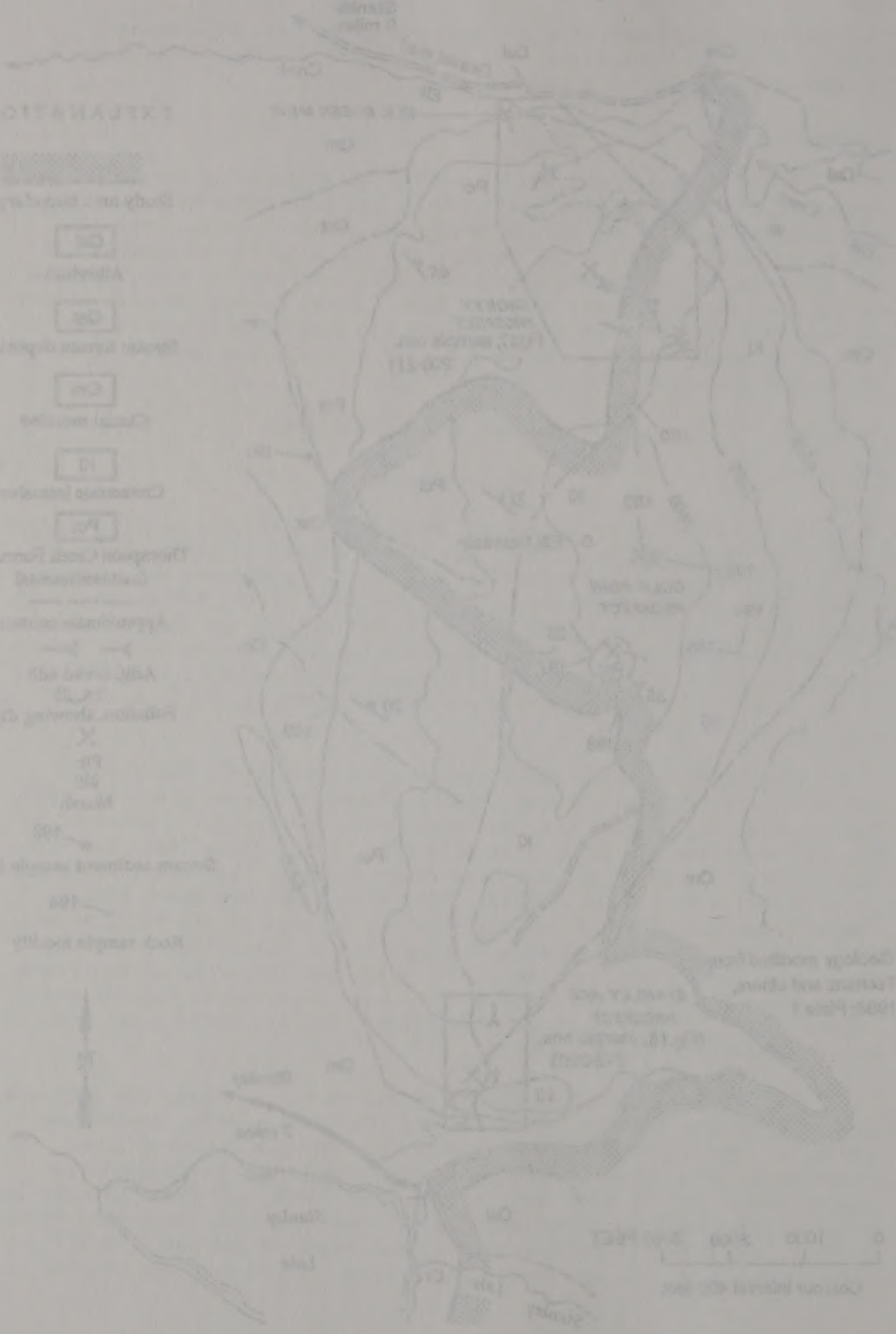


Figure 16.- Sample localities and geology at the Elk Mountain mineralized area



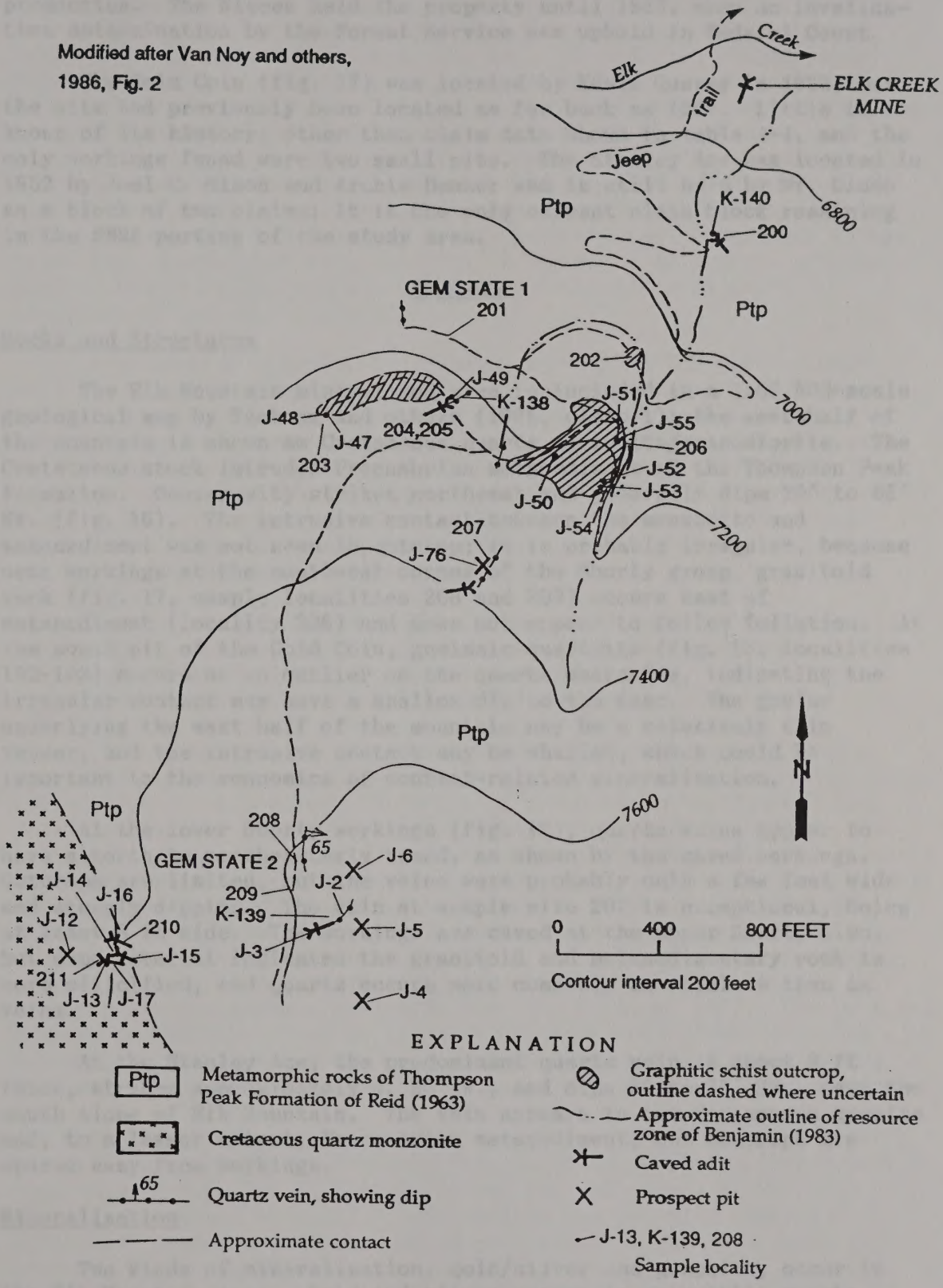


Figure 17.- Sample localities and geology at the Shorty (Gem State) prospect

production. The Nieces held the property until 1983, when an invalidation determination by the Forest Service was upheld in Federal Court.

The Gold Coin (fig. 17) was located by Edwin Querey in 1922, but the site had previously been located as far back as 1907. Little is known of its history, other than claim data shown in table A-4, and the only workings found were two small pits. The Stanley Ace was located in 1952 by Joel C. Olson and Archie Danner and is still held by Mr. Olson as a block of two claims; it is the only current claim block remaining in the SNRA portion of the study area.

Geology

Rocks and Structures

The Elk Mountain mineralized area is included in a 1:62,500-scale geological map by Tschanz and others (1986, plate 1); the west half of the mountain is shown as Cretaceous quartz monzonite/granodiorite. The Cretaceous stock intrudes Precambrian metasediment of the Thompson Peak Formation. Gneissosity strikes northeast and generally dips 20° to 65° NW. (fig. 16). The intrusive contact between the monzonite and metasediment was not seen in outcrop; it is probably irregular, because near workings at the southwest corner of the Shorty group, granitoid rock (fig. 17, sample localities 208 and 209) occurs east of metasediment (locality 206) and does not appear to follow foliation. At the south pit of the Gold Coin, gneissic quartzite (fig. 16, localities 192-193) occurs as an outlier on the quartz monzonite, indicating the irregular contact may have a shallow dip to the east. The gneiss underlying the east half of the mountain may be a relatively thin veneer, and the intrusive contact may be shallow, which could be important to the economics of contact-related mineralization.

At the lower Shorty workings (fig. 17), quartz veins appear to have a north to northeasterly trend, as shown by the caved workings. Outcrops are limited, but the veins were probably only a few feet wide and steeply dipping. The vein at sample site 207 is exceptional, being at least 8 ft wide. The workings are caved at the upper Shorty also, but dump material indicates the granitoid and metasedimentary rock is more silicified, and quartz occurs more commonly as veinlets than as veins.

At the Stanley Ace, the predominant quartz vein is about 9 ft thick, strikes approximately N. 60° W., and dips 30 to 35° SW., down the south slope of Elk Mountain. The vein appears to cut Cretaceous granite and, to a lesser extent, Precambrian metasediment; but outcrops are sparse away from workings.

Mineralization

Two kinds of mineralization, gold/silver and graphite, occur in the Elk Mountain area. Gold and silver occurs in epigenetic quartz veins and veinlets and appears to be localized along the quartz

production. The Blanca held the property until 1883, when an invalidation determination by the Forest Service was upheld in Federal Court.

The Gold Coin (file, 17) was located by Colin Query in 1922, but the site had previously been located as far back as 1907. Little is known of its history, other than ore data shown in table A-4, and the only workings found were two small pits. The Stanley Ace was located in 1932 by Joel C. Olson and Archie Benson and is still held by Mr. Olson as a block of two claims; it is the only current claim block remaining in the SMIL portion of the study area.

Geology

Rocks and Structure

The Elk Mountain mineralized area is included in a 1:62,500-scale geological map by Tschanz and others (1970, plate 1); the west half of the quadrangle is shown on Paleozoic quartz monzonite/granodiorite. The Paleozoic block intrudes Precambrian metasediments of the Thompson Park formation. Consequently strikes northeast and generally dips 20° to 65° NW. (file, 16). The intrusive contact between the monzonite and metasediment was not seen in outcrop; it is probably irregular, because roof pendants at the southwest corner of the Liberty group, described below (file, 17, sample localities 208 and 208) contain east of metasediment (locality 209) and does not appear to follow foliation. At the Queen pit of the Gold Coin, gneissic quartzite (file, 16, localities 102-103) occurs as an outlier on the quartz monzonite, indicating the irregular contact may have a dip to the east. The quartz monzonite underlying the east half of the mountain may be a relatively thin veneer, and the intrusive contact may be shallow, which could be important to the economics of contact-related mineralization.

As the lower Liberty workings (file, 17), quartz veins appear to have a north to northeasterly trend, as shown by the caved workings. Outcrops are limited, but the veins were probably only a few feet wide and steeply dipping. The vein at sample site 207 is exceptional, being at least 6 ft wide. The workings are caved at the upper Liberty also, but tuff material indicates the granitic and metasedimentary rock is more silicified, and quartz occurs more commonly as veinlets than as veins.

At the Stanley Ace, the predominant quartz vein is about 3 ft thick, strikes approximately N. 60° W., and dips 20 to 30° SW., down the south slope of Elk Mountain. The vein appears to cut Cretaceous granite and, to a lesser extent, Precambrian metasediments; but outcrops are sparse away from workings.

Mineralization

Two kinds of mineralization, gold-silver and cassiterite-bearing, occur in the Elk Mountain area. Gold and silver occurs in polygonal quartz veins and veinlets and appears to be localized along the quartz

monzonite/metasediment intrusive contact, as evidenced by: 1) two of four samples from the upper Shorty prospect (Gem State 2) contained 0.095 and 0.01 oz/ton gold (fig. 17, nos. 210 and 211, respectively), which was associated with geothite boxwork and pyrite pseudomorphs, while samples from the lower Shorty, within the metasedimentary terrane, are weakly mineralized; and 2) mineralization at the Stanley Ace prospect occurs in the vicinity of the contact (fig. 18). Sulfide minerals observed include arsenopyrite, pyrite, and a fine-grained sectile gray sulfide. One select sample (no. 213) of quartz vein material contained 0.113 oz/ton gold. However, the predominant quartz vein (fig 18 and table A-1, no. 219) is barren of gold where sampled, while a sample of the underlying country rock, foliated granite, contained 25 ppb Au (sample 217).

Five samples taken at the Stanley Ace during the present study, out of a total of 18 samples, contained detectable gold. One sample taken by the Forest Service in 1961 contained 1.32 oz/ton gold and 0.3 oz/ton silver, and six Forest Service bulk samples (average weight 53 lbs) taken in 1986 contained a simple average of 0.067 (0.063 weighted average) oz/ton gold and no detectable silver. Sixteen samples taken by Mr. Olson between 1961 and 1989 averaged 0.264 oz/ton gold. An exceptional sample cut by George Kershner, Emmett, ID, mining engineer, for Mr. Olson assayed 7.204 oz/ton gold.

At the Gold Coin prospect, gold was not detected in rock samples during the present study, but geochemical analysis of two pan concentrate samples (fig. 16, nos. 191 and 199) from rivulets which drain the prospect area, contained 0.022 and 0.042 oz/ton gold.

Flake graphite appears disseminated throughout much of the gneissic metasediment on Elk Mountain, although a lack of outcrops makes this difficult to confirm. A sample of graphitic metasediment taken by Joel Olson at the Stanley Ace and analyzed by Western Analytical, Inc., of Salt Lake City, contained 3.43 percent total carbon. A select sample of float (fig. 17 and table A-1, no. 197) taken at the Gold Coin during the present study, although not analyzed for graphite, was visually estimated to contain 30 percent graphite. Flake graphite disseminated in gneisses in schist, such as occurs in the study area, is formed by regional metamorphic processes from syngenetic carbon within a carbonaceous sedimentary protolith (Taylor, 1985, p. 341). The rock was perhaps a silty argillite or argillaceous siltstone formed in a reducing environment which accumulated and preserved the carbonaceous remains of Precambrian organisms, and which was later metamorphosed into graphite.

Figure 17 shows approximately the area of known graphite outcrop and the resource zone of Benjamin (1983). Samples with a letter prefix were taken during the 1972 study by Van Noy and others (1986); the analyses are shown on table 2, and include six graphite analyses. Additional graphite analyses include seven by the USBM Salt Lake City Research Center in 1972, which averaged 2.47% carbon; seven samples studied by the New Mexico Tech Research Foundation (1972) for Ophir Exploration, which averaged 3.91% graphite calculated from flotation

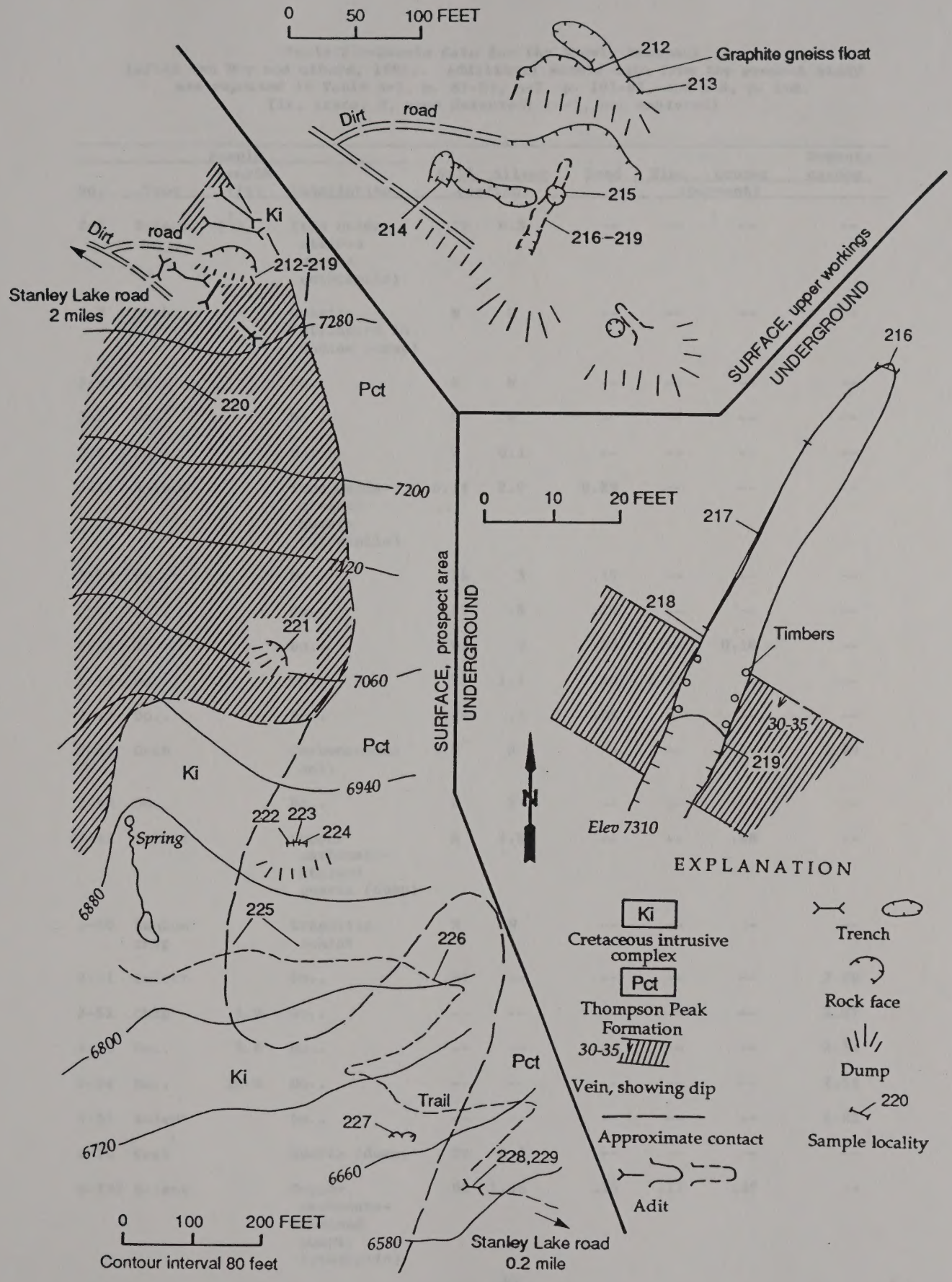


Figure 18.- Sample localities and geology at the Stanley Ace prospect

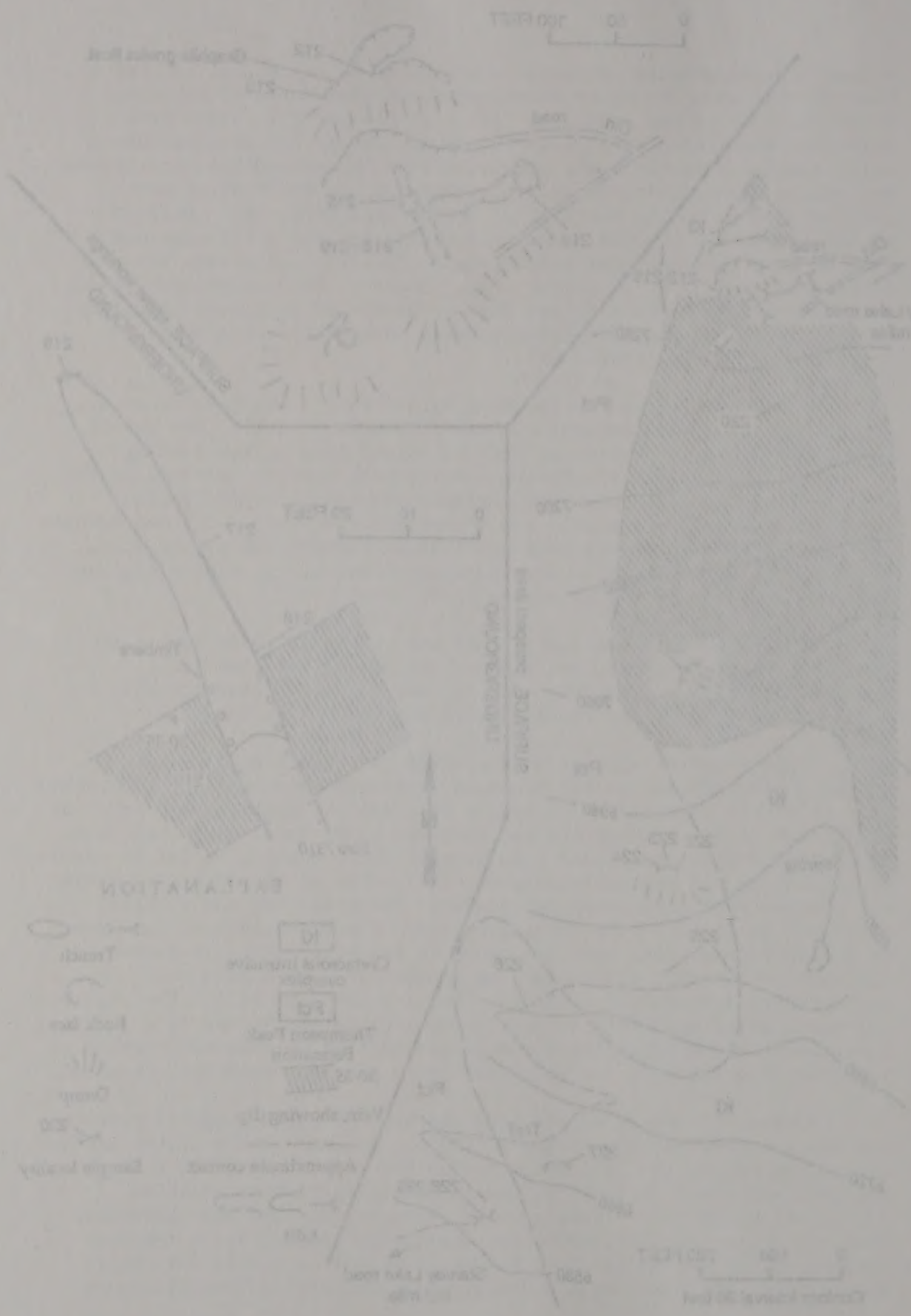


Table 2.--Sample data for the Shorty Prospect (after Van Noy and others, 1986). Additional sample data from the present study are reported in Table A-1, p. 87-89, A-2, p. 101-82, and A-3, p. 108. [Tr, trace; N, none detected; (--), not analyzed]

No.	Type	Sample Length (ft)	Description	Gold (oz/ton)	Silver (oz/ton)	Lead (percent)	Zinc (percent)	Copper (percent)	Organic carbon (percent)
J-2	Select	([1])	Iron oxide-stained quartz (stockpile)	Tr	0.3	--	--	--	--
J-3	Grab		Quartz stringers in gneiss (dump)	N	N	--	--	--	--
J-4	Do..		Do..	N	N	--	--	--	--
J-5	Do..		Do..	N	N	--	--	--	--
J-6	Do..		Do..	N	0.1	--	--	--	--
J-12	Select		Iron oxide-stained quartz (stockpile)	0.14	2.0	0.29	--	--	--
J-13	Do..		Do..	.25	.5	.15	--	--	--
J-14	Do..		Do..	.27	.8	.20	--	--	--
J-15	Do..		Do..	.03	.9	.36	--	0.16	--
J-16	Do..		Do..	Tr	1.1	.29	0.09	--	--
J-17	Do..		Do..	.25	.4	.05	--	--	--
J-47	Grab		Carbonaceous soil	N	N	--	--	--	1.99
J-48	Do..		Do..	N	N	--	--	--	--
J-49	Select		Copper carbonate-stained quartz (dump)	N	2.5	--	--	.98	--
J-50	Random chip		Graphitic schist	N	N	--	--	--	--
J-51	Select		Do..	.01	--	--	--	--	3.00
J-52	Chip	6.0	Do..	--	--	--	--	--	2.07
J-53	Do..	9.0	Do..	--	--	--	--	--	2.51
J-54	Do..	10.0	Do..	--	--	--	--	--	2.54
J-55	Select		Do..	--	--	--	--	--	2.60
J-76	Grab		Quartz (dump)	Tr	0.3	--	--	--	--
K-138	Select		Copper carbonate-stained quartz (stockpile)	.01	1.46	.15	.12	.30	--

Table 2.--Sample data for the Bixby Prospect

[Values for Dog and others, 1984). Additional sample data from the previous study are reported in Table 4-1, p. 87-89, 4-3, p. 101-03, and 4-4, p. 105; Tr, trace; B, base detected; ---, not measured]

Sample	Type	Silt, percent	Sand, percent	Total clay (bulk)	Total clay (<2 µm)	Iron oxide-cemented (percent)	Quartz (percent)	Feldspar (percent)	Calcite (percent)	Dolomite (percent)	Siderite (percent)	Ankerite (percent)	Pyrite (percent)
1-2	Bixby			Tr	0.3								
1-4	Osage												
1-6	Osage												
1-8	Osage												
1-10	Osage												
1-12	Bixby			0.14	2.0								
1-14	Osage												
1-16	Osage												
1-18	Osage												
1-20	Osage												
1-22	Osage												
1-24	Osage												
1-26	Osage												
1-28	Osage												
1-30	Osage												
1-32	Bixby												
1-34	Osage												
1-36	Osage												
1-38	Osage												

Table 2.--Sample data from the Shorty Prospect--Continued

No.	Type	Sample Length (ft)	Description	Gold (oz/ton)	Silver (oz/ton)	Lead (percent)	Zinc (percent)	Copper (percent)	Organic carbon (percent)
K-139	Chip	30.0	Iron oxide-stained quartz	0.023	0.44	0.004	0.04	0.004	--
K-140	Select		Iron oxide-stained quartz (stockpile)	.087	.058	.002	.001	.07	--

[1]Blank, not measured.

tests; and 13 samples taken by Benjamin (1983), which averaged 3.16% graphite carbon. Samples taken during the present study (fig. 17, numeric designations) were not analyzed for graphite; they are included in tables A-1, A-2, and A-3. Benjamin (1983, p. 13) defined 366,000 tons of measured and 1,528,000 tons of indicated resources (3.16% graphite carbon) at the Shorty claims.

Evaluation

Gold Occurrence

The 0.264 oz/ton average gold concentration in Mr. Olson's samples, at an average 1990 gold price of $400 per oz is worth about $105 per ton, which is about the minimum grade for underground mining. Bureau of Mines data from this study have not been able to repeat this high grade for the predominantly quartz vein samples taken. The results of Forest Service bulk sampling, yielding an average 0.067 oz/ton gold ($25 per ton), are more representative of grades mineable by open pit methods; this would necessitate finding a large, shallow tonnage within the quartz monzonite and metasediment country rock, which is plausible, but speculative at present.

Graphite Occurrence

The United States currently imports 100 percent of its graphite requirements, estimated at slightly over one million tons during 1990. Sources were: Mexico (37%), China (24%), Brazil (10%), Madagascar (7%), and other countries (20%). The domestic reserve base (measured plus indicated resources) is 1.1 million tons, or about a two year supply. End uses are estimated to be in refractories (27%), lubricants (17%), foundry dressings and molds (14%), brake linings (13%), pencils (5%), crucibles (4%), and other uses (20%) (U.S. Bureau of Mines, 1991, p. 66).

Benjamin (1983) described a small-scale mining and milling operation based on the 1.9 million tons[1] of measured and indicated graphite resources that he was able to identify. Mining would be by open-pit methods at a rate of 1,000 tons of ore and 1,130 tons of waste per day. The mine would operate one shift per day, 168 days per year over a nine-year life. Capital cost would be about $8.1 million and operating cost $8.68 per ton. A small flotation mill with an 840-tpd capacity would operate three shifts per day, 200 days per year; capital cost would be about $7.1 million and operating cost $6.61 per ton for milling, plus $2.56 per day for transport to market (Chicago, IL).

A discounted cash flow analysis was made using the USBM MINSIM4 computer program. A series of program runs indicated that a zero rate

[1]Converted from metric [1.1025 X tonnes (metric) = tons (short)].

of return on investment would require a product price of $968 per ton[2], 15% would require $1,486, and 25% would require $2,164. The price of flake graphite in 1983 was $550 per ton at foreign ports (U.S. Bureau of Mines, 1985, p. 62); the 1990 price is estimated at $1,067 per ton, an increase of 60%. Mining and milling costs, however, have risen 114% from January, 1983, to January, 1991 (Benjamin, written commun., 1991).

The graphite appears to occur throughout gneissic metasediments from the north to the south end of Elk Mountain; hence, it occurs in the eastern parts of all three prospects (Shorty, Gold Coin, and Stanley Ace). If graphite is pervasive, the mountain contains hundreds of millions of tons or perhaps one billion tons of graphite resources, approximately equal to the entire estimated 1990 global reserve base (U.S. Bureau of Mines, 1991, p. 67). However, in the study area, low outcrop density, due to a veneer of glacial moraine, makes the resources difficult to demonstrate; also, claim location is prohibited in the SNRA.

Recommendations

Further work to define large resources should include an EM (electromagnetic) survey and trenching and drilling. Further definition of large-scale resources may be worthwhile despite the no-mineral-entry status of the SNRA. The Elk Mountain mineralized area could be a major domestic source of graphite if the need for domestic sources develops.

OBSERVATION PEAK MINERALIZED AREA

Mining History

The Observation Peak (Omaha Gulch) area, inclusive of the Silver, Stanley Lake, and Trail Creek areas of Kiilsgaard and others (1970, p. D97-D99), appears to be historically the oldest prospected area in the Hanson Lakes study area. Claims were probably located on the south face of the peak prior to 1900 (fig. 19); however, records of these early claims were not found during a search of Boise County mining records (table A-4, part 3). The Olympic claim was located by John K. Benzer in 1915, but Benzer states in a claim paper the authors found on site that an earlier claim notice was washed away in a snowslide.

N. E. Livingston is the earliest claimant of record found during this study, having worked what is now the Greenback in 1903 and 1907. St. Joe Lead Company actively explored the Greenback site in 1907 and 20 ined 3,200 ounces of silver (Joel Olson, oral commun., 1991). Harry Trainoff located the property as a fifty-claim block and patented 11 of the claims in 1952. The Forest Service reportedly purchased the Greenback from Trainoff in 1954 for $178,000 (Joel Olson, oral commun.,

[2]converted from price per metric tonne [0.907 X $ per tonne = $ per ton]

of return on investment would require a product price of 100¢ per ton,
ice would require $1,180, and ice would require $2,160. The price of
lybdic graphite in 1982 was $800 per ton at foreign ports (U.S. Bureau of
Mines, 1983, p. 611); the 1820 price is estimated at $1,087 per ton, an
increase of 80%. Mining and milling costs, however, have risen 110%
from January, 1982, to January, 1983 (Benjamin, written commun., 1983).

The granite appears to occur throughout prelate metamorphic
from the north to the south end of Elk Mountain bosses. It occurs in the
exterior parts of all three prospects (Liberty, Gold Chain, and Stanley
Ann). It crystals is pervasive, the mountain contains hundreds of
millions of tons or perhaps one billion tons of graphite reserves,
approximately equal to the entire estimated 1980 global reserve base
(U.S. Bureau of Mines, 1981, p. 611). However, in the study area, low
ore grade density, due to a veneer of glacial overburden, makes the resources
difficult to demonstrate; also, claim location is prohibited in the
area.

Recommendations

Further work to define large resources should include an IP
(electromagnetic) survey and trenching and drilling. Further definition
of large-scale resources may be unlikely despite the near-surface
nature of the ores. The Elk Mountain mineralized area could be a major
domestic source of graphite if the need for domestic sources develops.

OBSERVATION TRAIL MINERALIZED AREA

Mining History

The Observation Peak (Cache Gulch) area, including of the Silver,
Stanley Lake, and Trail Creek areas of mineralized and others (1970, p.
587-588) appears to be historically the oldest prospected area in the
Cache Lake study area. Claims were probably located on the south face
of the peak prior to 1900 (fig. 19); however, records of those early
claims were not found during a perusal of Boise County mining records
(Table A-1, part 3). The Olympic claim was located by John K. Dawson in
1912, but Dawson abandon it a claim after the ambore found on site that
an earlier claim notice was stapled away in a snowslide.

R. E. Silverson is the earliest claimant of record found during
this study, having worked ost in the Greenback in 1903 and 1907.
St. Joe Lead Company actively explored the Greenback site in 1907 and 30
load 3,000 ounces of silver (Lost Olson, oral commun., 1981). Percy
Tenlorf located the property as a fifty-claim block and patented 11 of
the claims in 1925. The Forest Service reportedly purchased the
Greenback from Tenlorf in 1925 for $118,000 (Lost Olson, oral commun.,

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[1]Converted from 2 lbs per metric tons (0.001 X 2 per tons = 2 per ton)

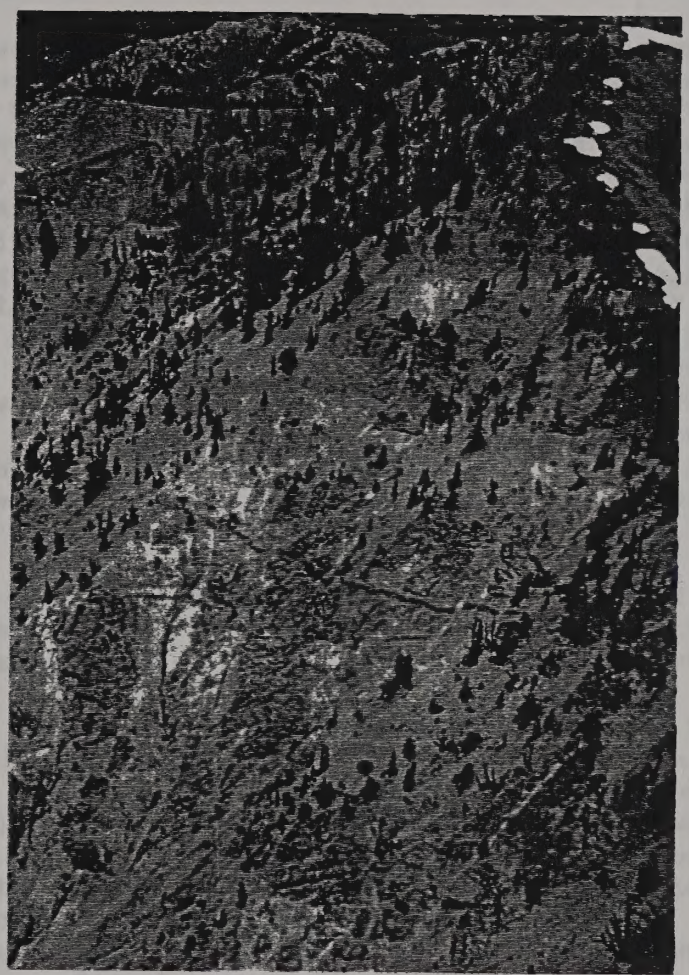
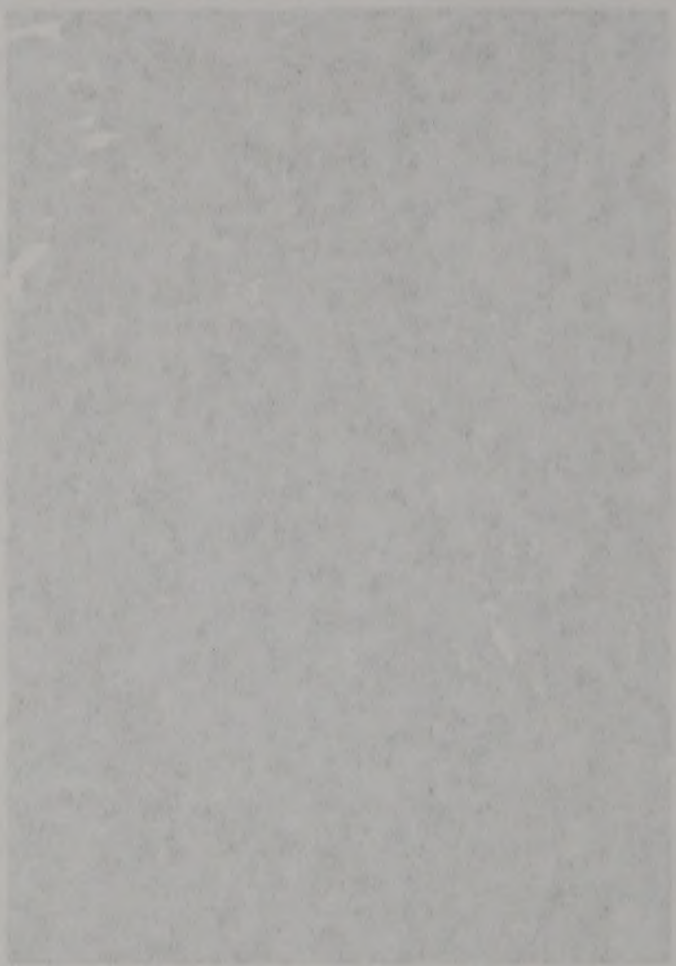


Figure 19.--South face of Observation Peak showing shear zones, quartz veins, and small workings



1991). The adits are now caved, including the main adit mapped by Joseph S. Coffman for the Bureau of Mines (Kiilsgaard and others, 1970, p. D94), and the main shaft is filled with headframe debris.

Geology

Rocks and Structures

The Observation Peak mineralized area is underlain by a white, mafic-mineral-poor, Cretaceous quartz monzonite pluton (fig. 3 and 20), first mapped by Reid (1963, plate 1). The light-colored stock intrudes more typical Cretaceous biotite granodiorite and quartz monzonite of the Idaho batholith. The leucocratic nature of the Observation Peak stock appears to be largely a primary characteristic; however, the content of trace metals, discussed below, as well as subtle but pervasive alteration, suggests the rock may not be as fresh as it appears. A significant portion of mafic-mineral-paucity may be due to alteration of mafic minerals, allowing Fe complexes to migrate with silica into structures and, to varying extent, out of the pluton. Perhaps this was a late cooling stage caused by volatiles from molten material at depth. The association of almost mafic-free facies with alteration and mineralization has been reported in the Black Warrior and Atlanta districts southeast of the Sawtooth Wilderness (Gabby, 1992, p. 7; Lance Bacon and Frank Hingley, Atlanta Gold Corp., oral commun., 1989).

The light-colored stock is cut by a number of quartz veins, which generally fill shear zones. On the south side of Observation Peak, the veins commonly strike west-northwest and dip about 30° northerly; traces of these veins, as well as pits left by early prospectors, can be seen on fig. 20. To the north, in the Greenback mine subarea, the veins strike north and dip 90° or dip very steeply. Many of the veins were mapped by J. S. Coffman (USBM) in 1967 (Kiilsgaard and others, 1970, figs. 29 and 30), and no attempt was made to repeat that work. In the vicinity of the Olympic prospect, a quartz "blowout" has occurred, possibly along the intrusive contact of the leucocratic stock with biotite granodiorite more typical of the Idaho batholith. Some resampling of veins was done, where still accessible, to update data with more precise multi-element analyses, and more granitic rock was sampled because of the new importance of low-grade disseminated gold deposits. Jointing (fig. 18) appears to reflect the northeast and northwest orientations found in the trans-Challis fault zone, although the mineralized area is several miles southeast of the main lineament.

Mineralization

Two types of mineralization occur in the Observation Peak area, quartz-vein-bearing shear zones and disseminated mineralization in granitoid rocks. Vein mineralization is predominantly silver-lead. Sulfide minerals observed include pyrite, galena, and a fine-grained sectile mineral (probably argentite). Metal concentrations in all 13 vein quartz samples were spotty or localized (table 3). Silver concentrations ranged from 8.8 oz/ton (450 ppm) to 0.09 oz/ton

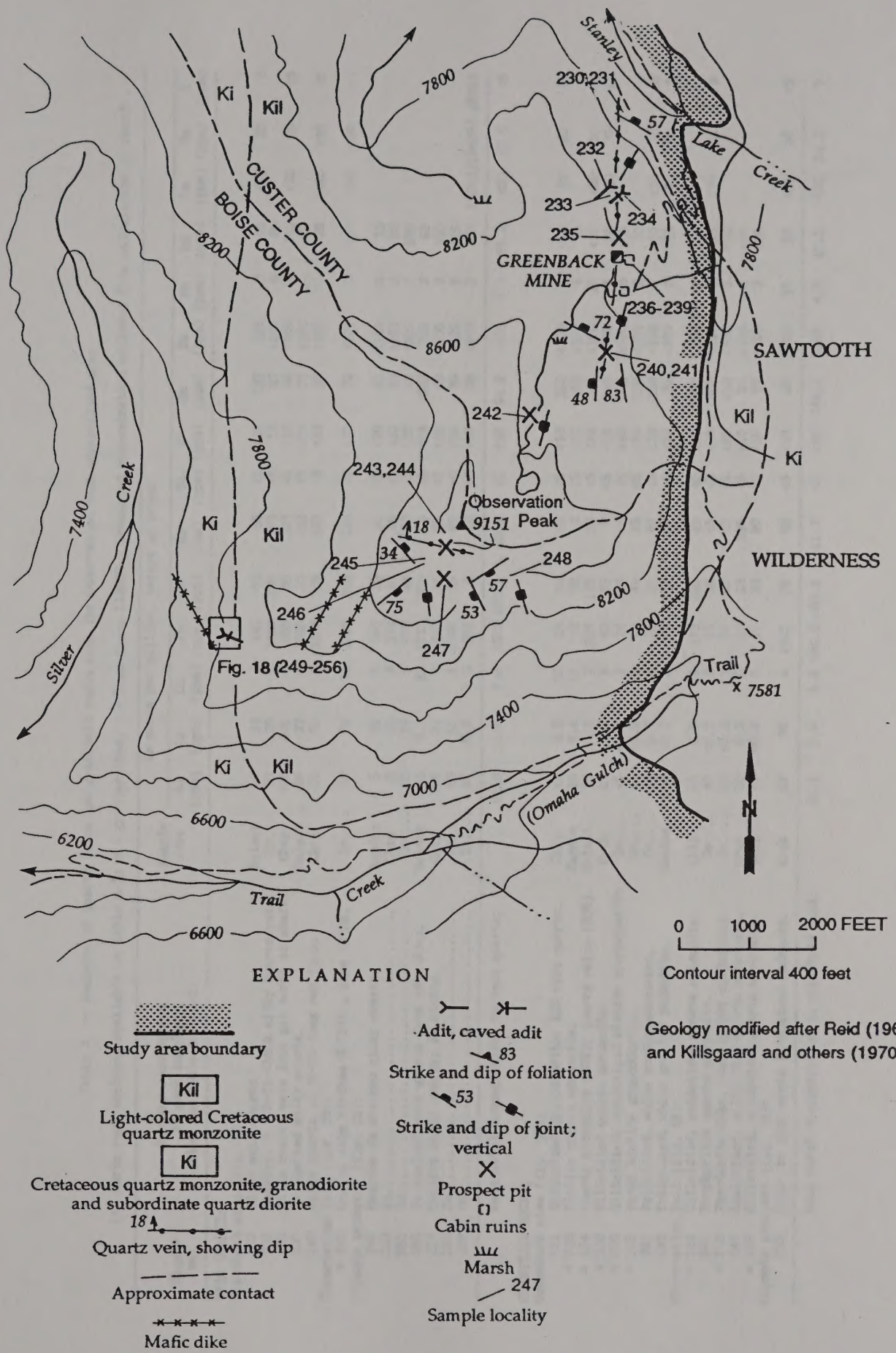


Figure 20.- Prospects, sample localities, and geology in the Observation Peak mineralized area

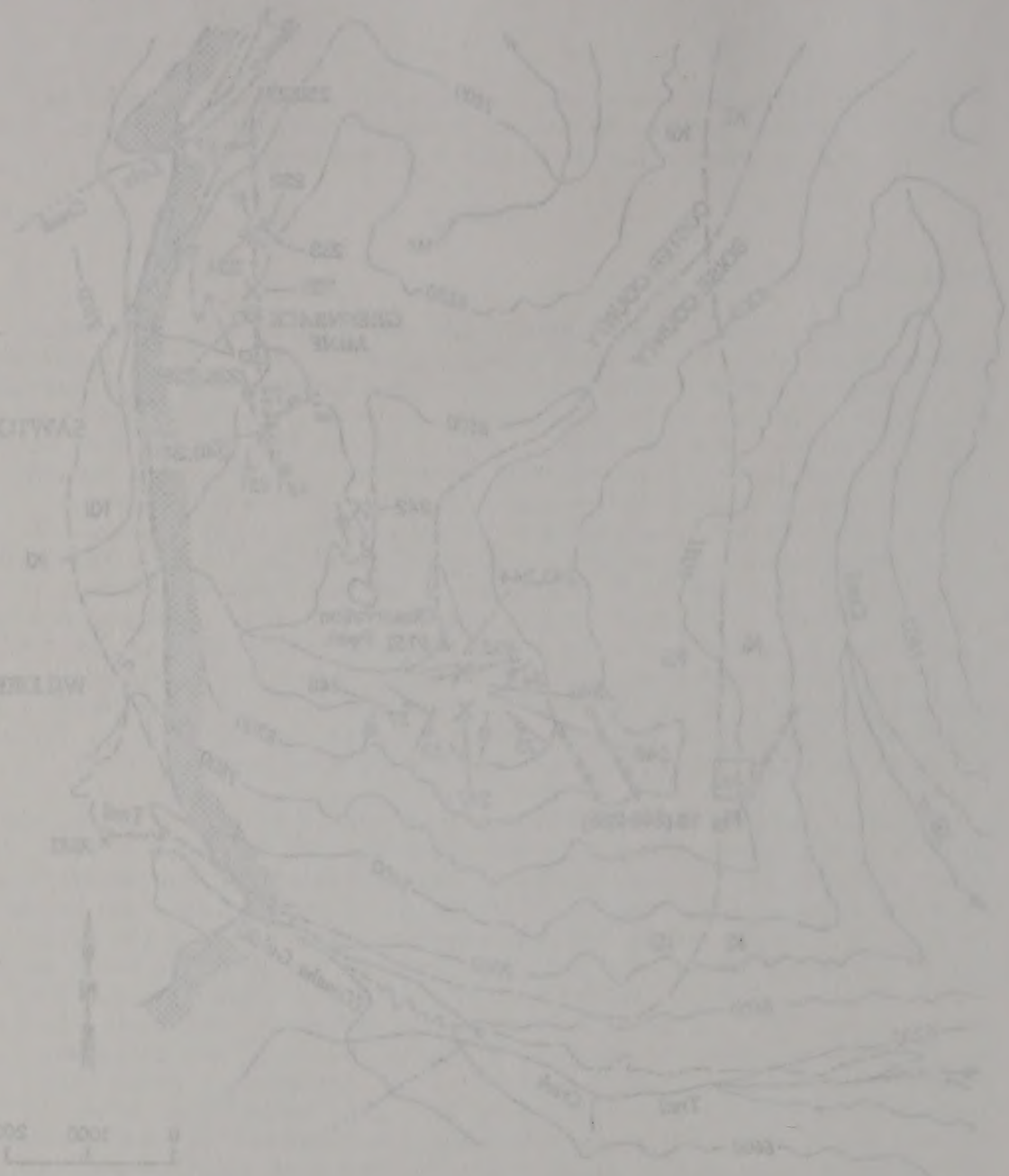


Table 3. -- Analyses of quartz veins and granitoid rocks from the Observation Peak mineralized area

[* Whole rock analyses available on table A-2; > - greater than, < - less than; [1360] - bracketed concentration excluded from calculation of mean]

Sample no.	Summary description of rock samples (also see table A-1, A-2)	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	As (ppm)	Sb (ppm)	W (ppm)	Mn (ppm)	Ba (ppm)	Mo (ppm)	Hg (ppb)	La (ppm)	Ce (ppm)	Y (ppm)
VEIN QUARTZ:																	
Greenback mine (fig. 20):																	
230	Milky vein quartz.	Select	5	14	5	445	79	55	<5	<10	122	125	3	15	<20	38	5
232	Massive, > 3.8-ft-thick milky quartz vein.	Do....	37	35	8	1480	330	185	<5	12	27	<100	6	30			
235	Milky quartz vein from pit north of shaft.	Chip	450	305	6	950	30	127	<5	<10	32	<100	2	135	<20	30	<5
237	Fe-stained milky quartz.	Select	38	27	5	1030	37	183	<5	<10	32	<100	13	20			
240	Milky quartz in 40-ft-long cut face.	Chip	25	88	6	3185	45	122	<5	<10	50	<100	1	25	<20	<10	<5
Observation Peak (Fig. 20):																	
* 243	Quartz vein strikes N.75°E., dips 18°NE.	Do....	19	32	15	3020	260	120	<5	<10	72	<100	3	115	<20	<10	<5
Olympic prospect (fig. 21):																	
249	Massive Fe stained milky quartz.	Random	5	35	5	380	30	60	<5	<10	42	<100	18	75			
250	Do.....	Chip	5	19	3	276	10	43	<5	<10	28	<100	5	60			
251	Do.....	Do....	35	19	5	895	48	110	<5	<10	43	<100	2	150			
252	Fe stained vein quartz from adit dump.	Select	<5	3.1	29	1715	1685	5	<5	<10	662	270	6	95			
254	Massive milky quartz; Fe stains.	Chip	105	34	4	745	15	67	<5	<10	40	<100	3	100			
255	Do.....	Do....	53	55	8	3590	29	65	<5	<10	36	<100	9	115			
256	Do.....	Do....	27	8.6	3	221	8	18	<5	<10	39	<100	2	180	[1360]	[3625]	[560]
	Mean metal concentration in vein quartz:		62.0	51.9	7.8	1379	200.5	89.2	<5	<10	94.2	<100	5.6	85.8	<20	19.5	<5
GRANITOID ROCKS;																	
Greenback mine (fig. 18):																	
231	Epidotized granodiorite; 10% vein quartz.	Chip	<5	0.2	10	26	66	60	<5	<10	295	<100	1	<10	32	80	13
* 233	Biotite quartz monzonite.	Random	10	0.4	10	41	32	8	<5	<10	152	<100	4	15			
* 234	Quartz monzonite (60%); quartz veins (40%).	Select	15	16	7	620	145	30	<5	<10	43	<100	15	<10	<20	<10	<5
* 236	Silicified quartz monzonite.	Grab	57	1.7	6	82	25	8	<5	<10	141	<100	4	10	<20	35	12
* 238	Silicified, epidotized biotite granodiorite	Do....	<5	<0.2	3	24	188	6	<5	<10	295	<100	3	<10			
* 239	Fresh biotite granodiorite.	Do....	<5	<0.2	2	13	46	<5	<5	<10	270	<100	2	10			
241	Epidotized, white quartz monzonite.	Do....	<5	0.7	4	25	58	60	<5	<10	280	<100	1	<10	<20	30	6
242	Epidotized, white granite pegmatite.	Random	350	<0.2	3	26	15	197	<5	<10	81	<100	3	<10	<20	25	9
Observation Peak (fig. 18):																	
* 244	Silicified, epidotized quartz monzonite.	Chip	<5	0.5	16	173	395	40	<5	<10	2450	<100	1	15			
245	Porphyritic quartz monzonite.	Do....	40	<0.2	3	15	36	<5	<5	<10	262	<100	3	<10	<20	38	9
* 246	Rhyodacite dike, locally 50% epidotized.	Do....	12	<0.2	3	34	45	<5	<5	<10	455	<100	3	<10			
247	Kaolinized, silicified quartz monzonite.	Grab	98	0.2	5	22	23	295	<5	<10	20	<100	2	<10			
* 248	Silicified, epidotized quartz monzonite.	Chip	33	<0.2	3	17	23	90	<5	<10	57	<100	3	<10			
Olympic prospect (fig. 20):																	
253	Blue- to gray-green Fe-stained andesite.	Grab	22	58	4	1610	26	62	<5	<10	20	<100	15	80	<20	32	<5
	Mean metal concentration in granitoid rock:		46.4	5.6	5.6	194.9	80.2	61.7	<5	<10	344.4	<100	4.3	12.5	<20	34.3	7

(3.1 ppm), but more typical concentrations were between 0.25 oz/ton (8.6 ppm) and 2.6 oz/ton (88 ppm). Excluding the highest and lowest concentrations, the average is lowered from 1.5 oz/ton (51.9 ppm) to 1 oz/ton (33.3 ppm). Gold averages just under 0.002 oz/ton (62 ppb); these concentrations are comparable to those reported in Kiilsgaard and others (1970, p. D93 and D95). Lead content is low, with a maximum of 0.36% (3,590 ppm) and an average of 0.14% (1,379 ppm).

Of note is an occurrence of the REE, including La (1,360 ppm), Ce (3,625 ppm), and Y (560 ppm), in vein quartz from the Olympic prospect (fig. 21; table 3, no. 256). The occurrence threshold, used in this report, is from the REE threshold determined for placer occurrences in the study area; Observation Peak area data is insufficient to develop separate criteria. A REE commodity profile is discussed on following pages under Placer Commodities.

Fourteen samples of predominantly granitoid country rocks were taken to check for disseminated mineralization. These rocks were weakly but pervasively altered, were weakly mineralized with gold, and contained anomalously high concentrations of other metals (table 3). Gold was an order of magnitude higher than typical concentrations in granitic rocks, and As is two orders higher (Parker, 1967, p. D14). Gold, As, and Mo concentrations within the granite and the vein quartz are essentially the same, contrary to traditional expectations (Minor differences could be attributable to the small sample population.). (Mean concentrations of Ag, Pb, and Hg appear high as shown on table 3, but are biased by a mineralized piece of andesite from the Olympic adit dump.) Differing metal concentration patterns between the vein quartz and granitoid rocks probably indicate different mineralizing events. Disseminated gold mineralization in the granitoid rocks probably preceded mineralization in the cross-cutting shears and veins, and may be a late cooling phenomena proximal to the apex of the leucocratic stock, and may have destabilized protolithic mafic silicates. The quartz monzonite/granodiorite stock could have been the source for what Au, As, and Mo does occur within the shear/quartz vein structures.

Evaluation

Vein Mineralization

The highest silver concentration in vein samples, at 8.8 oz/ton, is worth only $44 per ton at an estimated $5 average 1990 silver price (U.S. Bureau of Mines, 1991, p. 148). Furthermore, the mean concentration of all vein samples, 1.5 oz silver per ton, is worth only $7.50 per ton. Excluding the high and low concentration samples of 1 oz per ton, the mean value is only $5.00 per ton. Since underground mining costs would be substantially in excess of $100 per ton, the veins are uneconomic at relatively low current silver prices, even if a resource could be defined.

The REE occurrence at the Olympic prospect is of potential economic significance if it reflects a substantial hydrothermal deposit

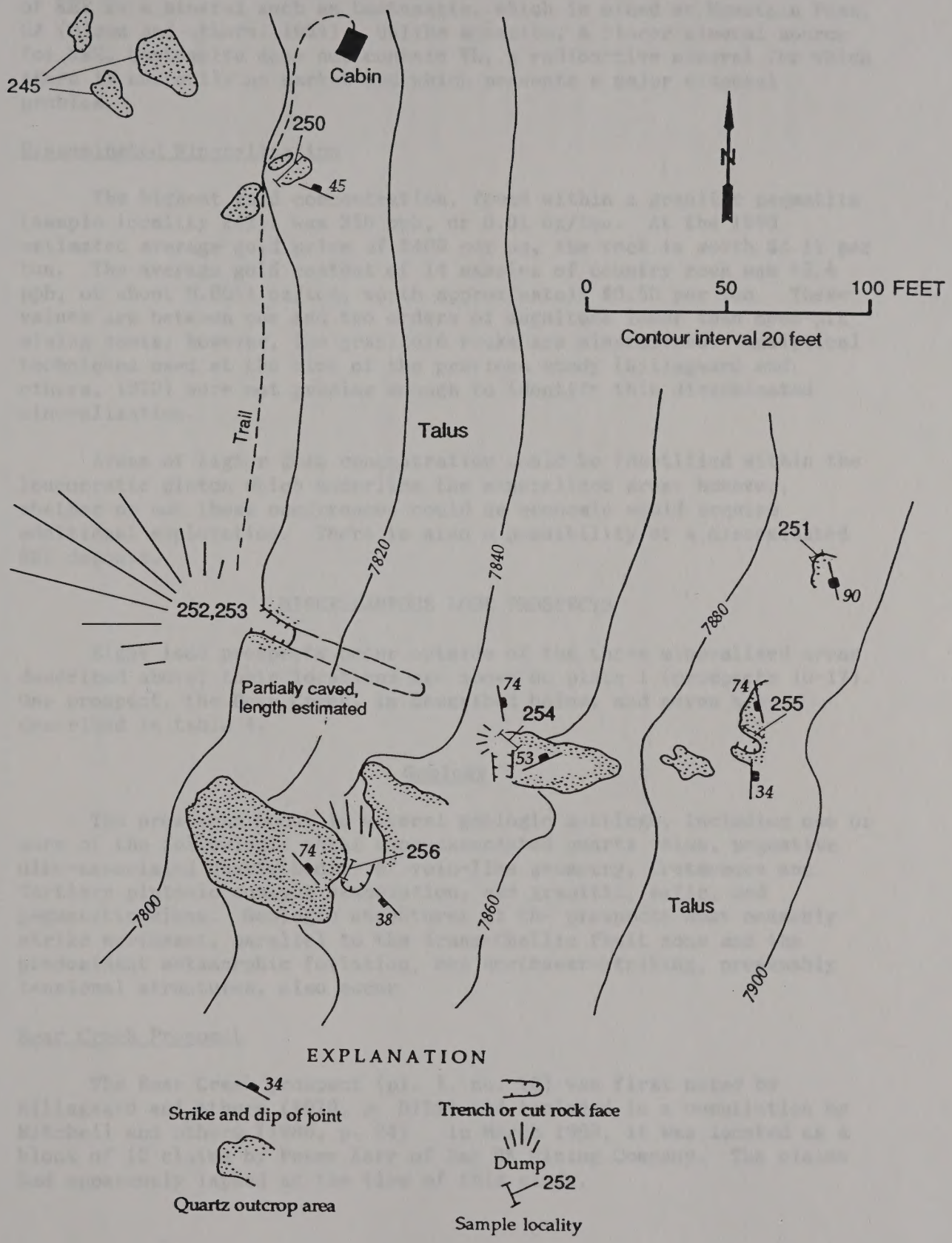


Figure 21.- Sample localities and geology at the Olympic (Plumb Bob) prospect

of REE in a mineral such as bastnasite, which is mined at Mountain Pass, CA (Olson and others, 1954). Unlike monazite, a placer mineral source for REE, bastnasite does not contain Th, a radioactive mineral for which there is currently no market and which presents a major disposal problem.

Disseminated Mineralization

The highest gold concentration, found within a granitic pegmatite (sample locality 242), was 350 ppb, or 0.01 oz/ton. At the 1990 estimated average gold price of $400 per oz, the rock is worth $4.11 per ton. The average gold content of 14 samples of country rock was 46.4 ppb, or about 0.0014 oz/ton, worth approximately $0.50 per ton. These values are between one and two orders of magnitude lower than open-pit mining costs; however, the granitoid rocks are mineralized. Analytical techniques used at the time of the previous study (Kiilsgaard and others, 1970) were not precise enough to identify this disseminated mineralization.

Areas of higher gold concentration could be identified within the leucocratic pluton which underlies the mineralized area; however, whether or not these occurrences could be economic would require additional exploration. There is also a possibility of a disseminated REE deposit.

MISCELLANEOUS LODE PROSPECTS

Eight lode prospects occur outside of the three mineralized areas described above; their locations are shown on plate 1 (prospects 10-17). One prospect, the Bear Creek, is described below, and seven are described in table 4.

Geology

The prospects occur in several geologic settings, including one or more of the following: shear zone-associated quartz veins, pegmatite dike-associated quartz bodies of vein-like geometry, Cretaceous and Tertiary plutonic contact association, and granitic, mafic, and pegmatitic dikes. Geologic structures at the prospects most commonly strike northeast, parallel to the trans-Challis fault zone and the predominant metamorphic foliation, but northwest-striking, presumably tensional structures, also occur.

Bear Creek Prospect

The Bear Creek prospect (pl. 1, no. 16) was first noted by Kiilsgaard and others (1970, p. D122) and included in a compilation by Mitchell and others (1986, p. 34). In March 1980, it was located as a block of 15 claims by Peter Karr of Bar RK Mining Company. The claims had apparently lapsed at the time of this study.

Table 4.--Miscellaneous lode and placer prospects in and near the Hanson Lakes study area

Map No. (Pl. 1)	Name	Summary	Workings	Sample Data
Lode prospects				
10	Black	A heavily iron oxide-stained milky quartz vein, strikes about N. 40° W. and dips 30° SW., appears to be 5.3 ft thick. Country rock is a subfoliate, weakly altered, hornblende biotite granodiorite. Foliation strikes N. 55° E., dips 75° SE. Joints strike N. 25° W., dips 75° NE.	One trench trends S. 40° W. two-thirds up a north-facing wooded slope. A rock cut is 10 ft long ending at a 4-ft-high face; 15-ft-long elongate dump extends 15 ft northeast.	A chip sample of vein quartz (pl. 1 and table A-1, no. 257) contains 430 ppm Cu, 1,320 ppm Pb, and 735 ppm Zn. The same elements in country rock (no. 258) were 1 to 2 orders of magnitude lower.
11	Shirley Ann	Located by George J. Murdock in 1964 on north rim of a butte. Vein-like milky quartz in granite pegmatite dike, which strikes N. 20° W., dips 33° NE.; coarse- to very coarse-grained muscovite biotite granite. Joints strike N. 54° W., dip 75° SW.	A shallow, 20-ft-long, 5-ft-wide trench trends N. 70° E.; 3-ft-high wall of excavated boulders borders south side of trench.	A 1.5-ft-long chip sample (pl. 1 and table 5, no. 259) contained anomalously low base metals; gold and silver were undetected. A random chip sample of country rock (no. 260) contained somewhat greater base-metal concentrations.

Table 4.--Miscellaneous lode and placer prospects in and near the Hanson Lakes study area--Continued

Map No. (Pl. 1)	Name	Summary	Workings	Sample Data
12	Golden Fleece	Located in 1910 by John Farr. The prospect area from mining claim description is underlain by pink granite of probable Tertiary age.	None found.	A grab sample of pink granite (pl. 1 and table 2, no. 261) and a stream sediment sample (no. 262) contained no significant metal concentrations.
13	Unnamed prospect	A 200-ft-wide salmon-to-carrot-pink felsite dike (pl. 1) was reported to contain 40 ppm molybdenum (Joel C. Olsen, oral commun., 1990). USBM sample analyses showed no anomalous Mo.	None found.	A sample of iron oxide-stained, coarse-grained, pink and white granite (pl. 1 and table A-1, no. 263) and a carrot-pink felsite dike (sample 264) contained no significant metal concentrations.
14	Upper Bear Creek prospect [Bear Creek prospect no. 2 (map no. 1012 of Mitchell and others, 1986)]	First reported by Kiilsgaard and others (1970, p. D122, sample 1657). Locally epidotized and silicified granite and granodiorite, with a northeast striking, steeply dipping granite pegmatite and a mafic dike, occur in a saddle between Mt. Zumwalt and the main Sawtooth ridge.	None found.	Three samples were taken (pl. 1 and table A-1, nos. 265-267). One granite sample (266) contained anomalous REE concentrations.

Table 4.--Miscellaneous lode and placer prospects in and near the Hanson Lakes study area--Continued

Map No. (Pl. 1)	Name	Summary	Workings	Sample Data
15	Unnamed prospect [Stanley Lake Creek outcrop (map no. 1013 of Mitchell and others, 1986)]	Outcrop described by Kiilsgaard and others (1970, p. D96) in the NW¼ of sec. 13, T. 10 N., R. 11 E. Quartz facies of a northeast-striking pegmatite dike (pl. 1, no. 269). A subparallel shear zone about 1,500 ft northwest (no. 268) and a northwest-striking pegmatite dike (no. 270) were also examined.	None found.	Three samples were taken (pl. 2 and table A-1, nos. 268-270); they contained no significant metal concentrations.
17	Can Pa	Located in June, 1989, by Bill Villers, Fruitland, ID, over an older placer claim by the same party. A 4.5-ft-wide andesite dike, strikes N. 20° E., dips 66° NW., and crops out in the west bank of Canyon Creek, directly north of Grandjean road bridge. Six to 12 ft of altered biotite schist crops out below and above the dike. The dike extends northeast on the west side of the creek for several hundred ft. A leucocratic zone in gneissic granite, several hundred ft east of Canyon Creek, was also examined.	None found.	Four samples were taken (pl. 1, nos. 276-279). A pan concentrate sample (276) contained 25 ppb gold. A dike sample (table A-1 and A-3, no. 277) contained 53 ppb gold, and altered biotite schist (278) taken below the dike contained 190 ppb Hg.

Table 4.--Miscellaneous lode and placer prospects in and near the Hanson Lakes study area--Continued

Map No. (Pl. 1)	Name	Summary	Workings	Sample Data
Placer prospects				
23p.	Bench Creek	The Bench Creek area was located for black sand mineral, as part of the Bull Trout group, by W. R. McDowell in 1953. Flood plain material at Bench Creek is poorly stratified to unstratified and angular. The low stream gradient of 1% to 2% indicates an aggrading bed load. Sediment available for placer mining is about 5 million yd^3, but is part of a much larger deposit directly west in the Bull Trout Lake area.	None found.	A reconnaissance pan sample (table A-1, no. 304) and a reconnaissance sluice sample (no. 305) were taken. The sluice sample qualified as an REE occurrence (table 4), but the poorly stratified material indicates extensive reconcentrated black sands do not occur in the drainage.
24p.	No Sweat	The prospect is centered over two small glacial cirques; sediment consists of glacial moraine; fluvial reworking was nonexistent or very minimal.	None found.	Two reconnaissance pan samples (table A-1, no. 306 and 307) from intermittent rivulets contained no free gold and no significant REE concentrations.

Table 4.--Miscellaneous lode and placer prospects in and near the Hanson Lakes study area--Continued

Map No. (Pl. 1)	Name	Summary	Workings	Sample Data
25p.	Trap Creek	The lower Trap Creek area contains fairly well stratified material, but the sampled area was situated on the lowest tread of a glacial stairway, and sediment appeared to be mainly glacial outwash which had undergone only moderate reworking. Alluvial deposits are less than 10 million yd^3.	None found.	A reconnaissance pan sample (pl. 1 and table A-1, no. 309) and a reconnaissance sluice sample (no. 308) both contained elevated REE concentrations. The sluice samples contained La and Ce just under the cutoff defining occurrence.
28p.	North Fork of Canyon Creek (Lost Cabin)	Records are vague, but two 180-acre association placer claims appear to have been located on the North Fork. Concentrations of black sands were found, but alluvial volume is too small for an economic deposit by an order of magnitude.	None found.	Three reconnaissance sluice samples were taken (pl. 1 and table A-1, nos. 318-320); two samples contained REE concentrations and one (table 4, no. 320) qualified as an occurrence.
30p.	Payette	Adjacent to, but outside, the study area. See Jones, J. J. (1986), and Kiilsgaard and others (1970, p. D82-91).	None found.	No samples taken during this study.

Mineralization occurs along variably northeast-striking, strongly epidotized shear and breccia zones within Tertiary granite, south of, and adjacent to an intrusive contact with Cretaceous quartz monzonite (compare figs. 2 and 3), and in granitic ejecta within the quartz monzonite. Five samples taken from the prospect (pl. 1 and table A-1, nos. 271-275) included two stream sediment and three rock samples. Sample 273, of epidotized pink pegmatite, vein quartz, and boxwork after sulfide minerals, contained the highest gold concentration of any sample from the study area, 0.343 oz/ton (11,750 ppb).

Evaluation

Gold in the high sample at the Bear Creek prospect represents a worth of $137 per ton of ore, at a 1990 estimated gold price of $400 per ounce (U.S. Bureau of Mines, 1991, p. 64); this gold value is high enough for open-pit mining and possibly underground mining methods. However, no resources have been identified. The prospect is outside of the SNRA and is open to mining claim location. Consideration of the prospect as a target for further exploration is warranted.

Other miscellaneous lode prospects do not have the high gold concentrations of the Bear Creek prospect; however, they occur in similarly mineralized terrane. The northwestern portion of the study area is in the trans-Challis fault zone, and various other geological structures in the study area have orientations similar to the fault zone.

SACAJAWEA HOT SPRINGS

Sacajawea Hot Springs occurs along the north bank of South Fork of the Payette River, about 0.5 mi west of Sawtooth Lodge (Grandjean). Approximately a dozen small springs occur; total water discharge is about 150 gallons per minute. A composite sediment sample from rivulets issuing from the springs (pl. 1 and table A-1) did not contain significant metal concentrations. Water temperature varied from 63° to 68°C (145° to 154°F) at the fountainheads, a temperature too low for dry steam, the most efficient medium for electric power generation; and therefore from the hot springs qualify only as a low-temperature geothermal source (Sammel, 1978).

Low-temperature geothermal waters are considered to have significant potential for utilization in space heating and agricultural applications on a local basis. However, Sacajawea water temperatures are much higher than the 38°C minimum for power production by the binary systems process (Rinehart, 1980, p. 199). In binary systems, low boiling-point carriers such as freon and isobutane are used as heat transfer agents. Geothermal water heats the transfer agents, which volatilize, driving turbine generators. Installation of a 2-megawatt binary power plant near Wendel, CA was reported by Munts and Peters, (1987, p. 23).

The Sacajawea hot springs are within the SNRA but adjacent to the western boundary. Development may be feasible a modest distance to the west of the recreation area. Additional feasibility studies would need to be carried out in order to establish a geothermal resource.

PLACER PROSPECTS

Mining History

Early placer mining history in the vicinity of the Hanson Lakes study area was discussed under regional mining history; other accounts are found in Choate (1962) and Van Noy and others (1986, p. 457-468). During the 1870's, after a few years of developing mines in the central basin near Stanley, placer miners worked their way northwest up Valley Creek. Important properties like Willis Diggins and Buckley Bar were operated on Stanley Creek east of the study area, as well as on Valley Creek to the northeast near the Buckskin and Valley Creek lode mines (fig. 1). Between 1900 and 1914, a 2,000 cubic-yard-per-day dredge was intermittently operated along Stanley Creek and produced $0.30 to $1.00 per yd^3 in 650-fine gold at a $20 per oz gold price. Mining tapered off by the 1920's largely due to the fixed gold price. Mining revived during the depression, with the fixed gold price elevated to $35 per ounce; the Willis Diggins produced $23,000 in gold between 1933 and 1938 (Choate, 1962, p. 114-116).

During 75 years (1875-1950) of intermittent placer mining adjacent to the study area, minor unrecorded production occurred within the area, along the lower reaches of Elk and Meadow Creeks. Study area creeks were prospected, and had placer claims located along much of their length during the last 115 years. Little gold was found in other drainages of the region. Between 1936 and 1951 there was a hiatus of mining claim recordation activity within the study area (appendix A-4).

During 1950, the USBM investigated heavy minerals of the Bear Valley area (Porter mine, fig. 1) after local property owners reported monazite and radioactive black sands (Kline and others, 1953, p. 4). Claim location resumed again in 1951 in the study area, as part of a regional staking rush. Claimants, including W. J. Jarvis and W. R. McDowell, prospected for black sand placer minerals containing Nb and Ta, both critical ferroalloy elements, and REE and U. Jarvis located claims up the length of Swamp Creek, and the entire length and width of the mile-wide Marsh Creek flood plain that borders the northeast side of the study area (pl. 1). McDowell located the Bull Trout group, which covered the upper reaches of Banner Creek and extended into the study area at Bench Creek. Both men actively prospected the Bear Valley area (Kline and others, 1953, p. 22). The only production of radioactive black sands in the region was at the Porter Brothers Corporation's Big Meadows deposit. Between 1955 and 1959, the deposit produced 1,050,000 lbs of concentrates, containing 90% niobium-tantalum pentoxides, for the U.S. Government General Services Administration (Kiilsgaard, 1986, p. 6).

Geology

Examination Methods

Each stream drainage in the study area with substantial placer gravel (see patterned areas - pl. 1) had formerly been located for placer minerals, and was examined during this study. The significant placers are discussed below; less important properties are summarized in table 4. The lower reaches of study area streams, which had the largest flood plain segments and were accessible by vehicle, were trenched. The samples were partially concentrated in the field in a 6-ft-long sluice box, using a gasoline-fueled pump to supply water (fig. 22). Reconnaissance pan and sluice samples were taken along the higher reaches of streams, utilizing 14-in.-wide pans, and a light-weight, 3-ft-long sluice, which was highly portable.

Flood plain deposits along creeks in and adjacent to the study area probably extend 5 to 50 ft below the water table. The richest gold concentrations commonly occur at or near bedrock because of gold's high specific gravity. This is especially true within Stanley Basin, which is known for its coarse gold (Van Noy and others, 1986, p. 459). Within the scope of this study, it was not possible to trench more than a few feet below the water table. Therefore, estimated gold content within these placers is conservative.

Characteristics of Deposits

Paul L. Williams (1961) studied the glacial geology of the Stanley Basin, and Mackin and Schmidt (1953 and 1956) studied the origin of black sands and heavy minerals of Bear Valley. Radioactive black sand deposits in the vicinity of the study area include the following heavy minerals, in order of abundance: ilmenite; magnetite; monazite (an REE phosphate); euxenite-polycrase (isomorphous REE niobate-tantalate series); and lesser brannerite, samarskite, xenotime, fergusonite, uranophane, columbite, allanite, ilmenite, zircon, garnet, and gold. Typically, black sand grains are less than 16 mesh, and range from less than 1 lb to 30 lbs per yd^3 (Kiilsgaard and Hall, 1986, p. 7).

Significant areas of heavy-mineral-bearing flood plain occur along all streams in the eastern half and northwest quarter of the Hanson Lakes study area (pl. 1, patterned; fig. 2). Portions of the lowest flood plains of several streams, such as Thatcher, Swamp, Flat, Meadow, Elk, and Stanley Lake Creeks, are parts of larger stream flood plains that circumscribe half the study area, almost continuously. The larger plains extend from the junction of Cape Horn and Banner Creeks (along the northwest study area boundary) northeasterly to Cape Horn (along a trans-Challis lineament), thence southeasterly up Marsh Creek to its headwaters, then, in the same direction, down the lower reaches of Meadow and Valley Creeks.

The two southeast-trending segments are separated by a rocky, 0.5-mi-long, 160-ft-deep canyon called Trap Creek Narrows (pl. 1); the

Figure 22.--Placer crew, showing trenching and sluicing techniques, Cape Horn Creek prospect, trench 2

two linear segments appear to be displaced about 0.5 mi left laterally at the Narrows. The topography, as shown on the Elk Meadow 7.5-minute quadrangle, indicates Meadow and Trap Creeks may have flowed into Marsh Creek instead of Valley Creek, and that Marsh Creek flowed southeast into Valley Creek, instead of north to the Middle Fork Salmon River, during different times within the Pleistocene. The piracy episodes were caused by block faulting, which is still active. Older alluvial deposits within the Cape Horn, Marsh, and Valley Creek basins may have been part of a single fluvial system, partly within, and partly derived from the study area; the Valley Creek drainage is within the SNRA.

The richest and largest black sand occurrences (pl. 1, and table 5) are within the broad flood plains of Cape Horn Creek, and lower Swamp, and Marsh Creeks, which include the lower reaches of Meadow, Elk, and Stanley Lake Creeks. These occurrences are probably in reworked periglacial outwash, while the lack of occurrences in the interior of the study area may indicate glacial or recent outwash.

Occurrences

Placer sample-concentrates were analyzed geochemically for a 14-element suite, which included the REE's La, Ce, and Y; free gold was recovered by gravity separation. Nineteen samples contained significant REE concentrations (table 4). Eighteen of the samples came from 14 sites underlain by alluvial deposits; the sites are previously unreported occurrences. The REE occurrence thresholds, 1,124 ppm La, 2,770 ppm Ce, and 487 ppm Y (table 5) are based on geochemical analyses.

A REE occurrence is defined in this report as equal to, or greater than one-half the concentration found in a composite grab sample taken from the Porter mine concentrate stockpile (fig. 1, and tables 5 and A-1; no. 327). The REE element concentrations in 19 samples from this study were higher than concentrations in the Porter concentrate sample; they averaged 2,825 ppm La, 6,528 ppm Ce, and 611 ppm Y. The comparable Porter composite sample contained 2,250 ppm La, 5,540 ppm Ce, and 975 ppm Y (table 5).

Free gold was not significant, but was found in 28 of the 40 samples collected. The gold-bearing samples ranged from a trace to 0.004 oz gold per yd^3; the high sample, worth \$1.50 per yd^3 at a \$380 per oz gold price, was atypically high (table A-1).

Placer-Mineral Areas

Cape Horn Creek Placer

The Cape Horn Creek placer (fig. 23) was located under the names of at least seven claim blocks between 1906 and 1925; these are, by chronology and generally by block centers from north to south, the Wandering Girl and Cape Horn, 1906 (there was also an Old Cape Horn townsite); the Mountain Gem, 1919; the Banner and Deer Lick, 1925; and Junction, 1951 (Custer County mining records).

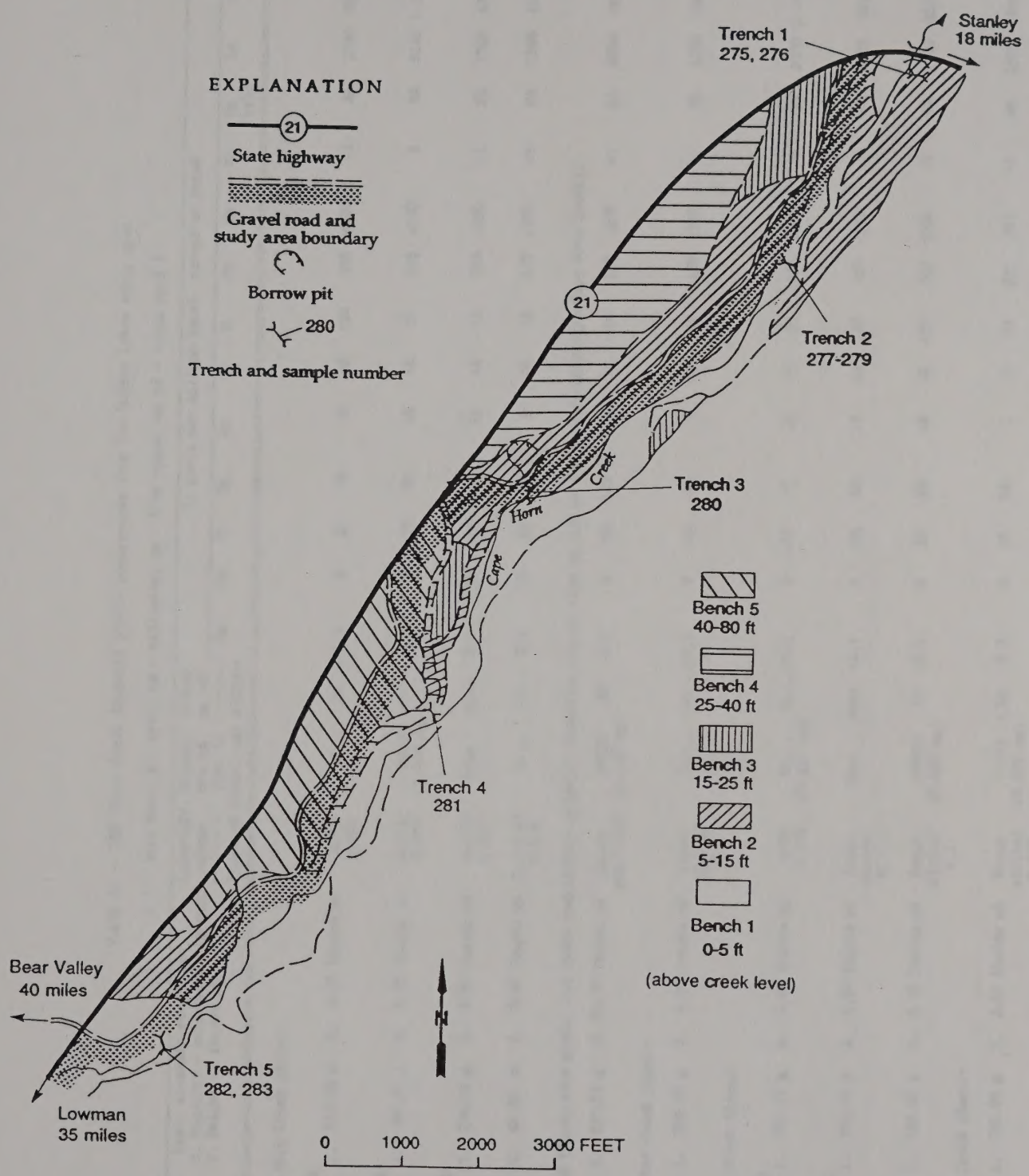


Figure 23.- Cape Horn Creek placer prospect

Table 5. -- REE (Rare Earth Element) placer occurrences from the Hanson Lakes study area

[< - less than, g - gram, mg - milligram, oz - troy ounce, cu yd - cubic yard]

PLATE 1. - Sample no.	Heavy minerals recovered: 1. Magnetic + nonmagnetic (grams) 2. Weight in lbs/cu yd	Interval/ volume ft/cu yd	Ounces/ cub yd free Au (total mg)	Value/ cu yd $400/oz	In parts per million (ppm), except as noted: Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
19p.) Cape Horn Creek placer:																		
Trench 3:																		
287	1. 119.93 g 2. 1.43 lbs/cu yd	0-5/ 0.185	Do...	Do...	0.1	6	21	48	<5	<5	<10	425	<100	<1	NA	2520	5850	375
Trench 4:																		
288	1. 164.20 g 2. 3.78 lbs/cu yd	0-2.4/ 0.089	.00001 (0.036 mg)	<.01	0.2	5	20	64	<5	<5	10	645	<100	1	NA	5540	1.30%	580
Trench 5:																		
289	1. 164.84 g 2. 2.50 lbs/cu yd	0-3.7/ 0.137	None	None	0.1	16	15	34	18	<5	10	370	<100	<1	NA	1750	4015	265
290	1. 48.33 g 2. 3.97 lbs/cu yd	3.7-5.5/ 0.067	Do...	Do...	0.1	10	11	34	8	<5	12	412	<100	<1	NA	1860	4150	250
Banner Creek [Occurrence grade, but lacks significant alluvial deposits; sample site is 0.5 mi above confluence with Cape Horn Creek]:																		
291	1. 287.74 g 2. 73.73 lbs/cu yd	Recon pan/0.016	.00020 (0.049 mg)	.08	0.1	9	22	117	<5	<5	<10	302	<100	<1	NA	3700	7850	275
20p.) Thatcher Creek placer:																		
295	1. 208.82 g 2. 4.28 lbs/cu yd	Recon sluice/ 0.1	Do...	Do...	<0.1	6	25	44	7	<5	<10	120	<100	<1	NA	1350	3180	125
21p.) Swamp Creek placer:																		
Trench 1:																		
300	1. 359.67 g 2. 2.68 lbs/cu yd	0-2/ 0.275	Do... (0.200 mg)	Do...	<0.1	7	57	71	<5	<5	25	1025	<100	3	NA	8350	2.00%	2710
Trench 2:																		
301	1. 165.93 g 2. 1.24 lbs/cu yd	Recon sluice/ 0.275	None	None	<0.1	5	28	55	<5	<5	10	485	<100	2	NA	3625	7850	915
302	1. 169.66 g 2. 3.48 lbs/cu yd	Recon sluice/ 0.1	.00003 (0.093 mg)	.01	<0.1	6	20	56	<5	<5	<10	348	<100	<1	NA	1700	3530	1380
23p.) Bench Creek placer:																		
305	1. 355.96 g 2. 2.67 lbs/cu yd	Recon sluice/ 0.273	.00001 (0.095 mg)	<.01	0.3	3	18	54	5	<5	42	275	<100	<1	NA	2125	4950	335

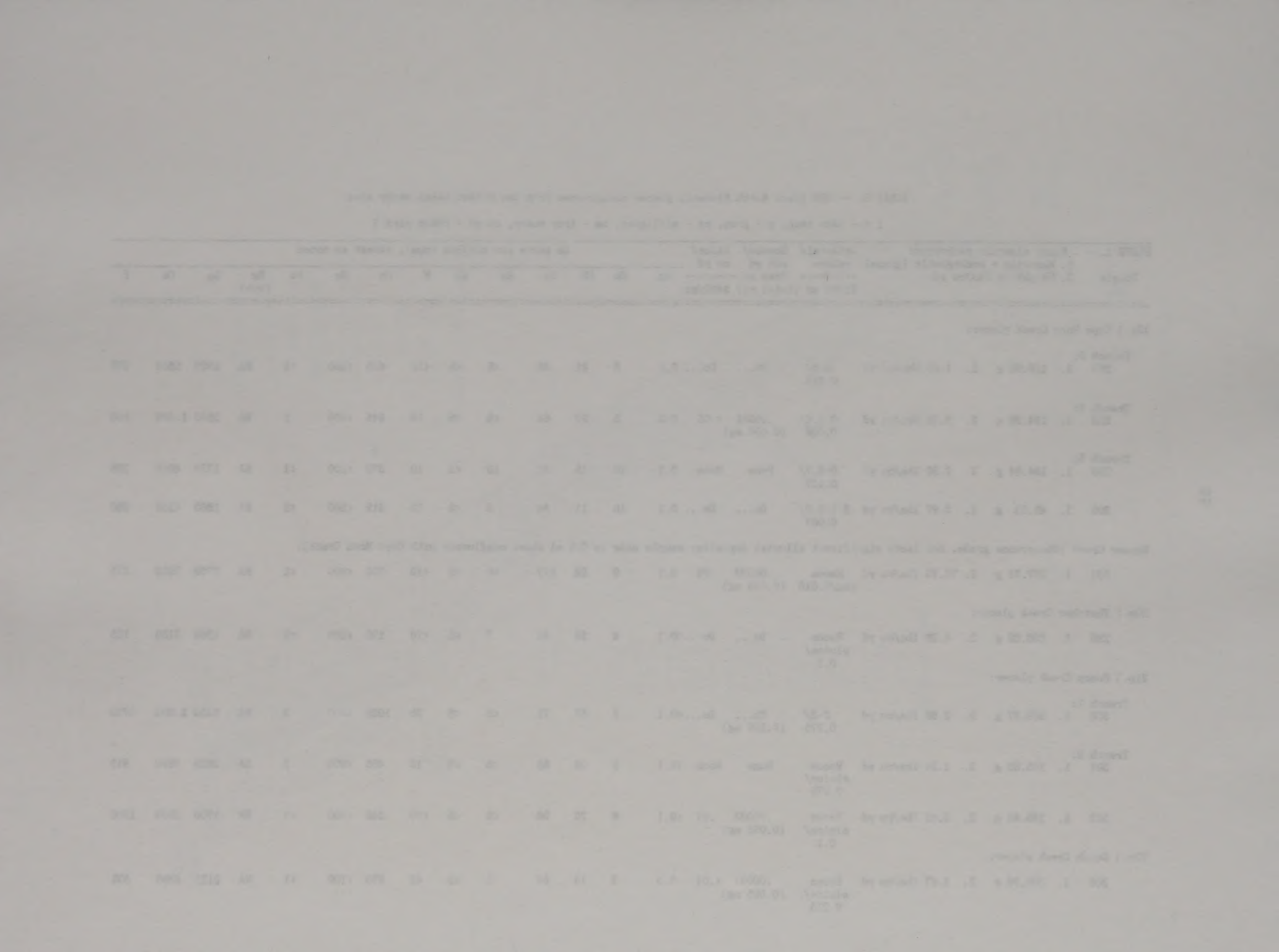
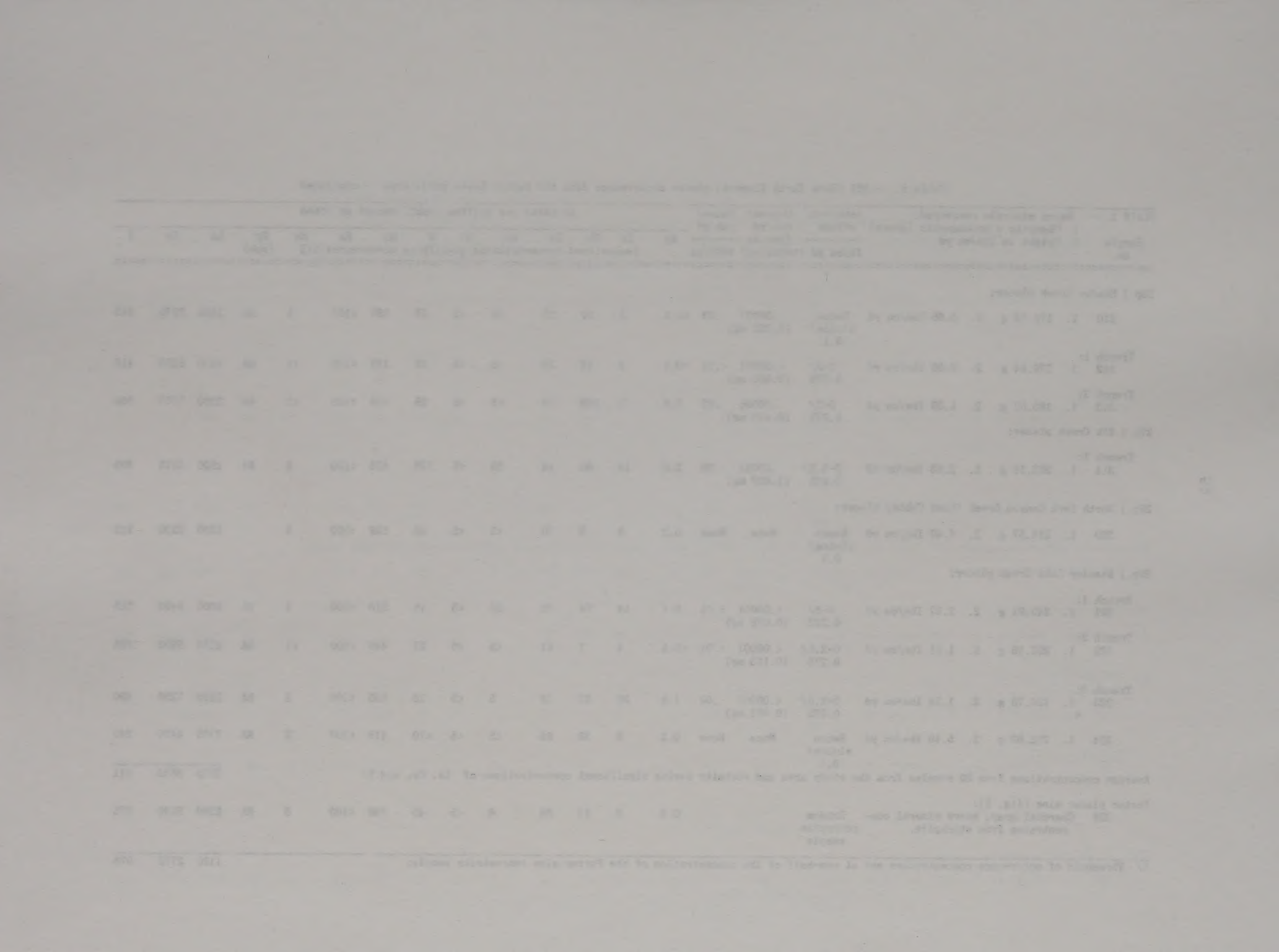


Table 5. -- REE (Rare Earth Element) placer occurrences from the Hanson Lakes study area -- continued

PLATE 1. - Sample no.	Heavy minerals recovered: 1. Magnetic + nonmagnetic (grams) 2. Weight in lbs/cu yd	Interval/ volume ft/cu yd	Ounces/ cub yd free Au (total mg)	Value/ cub yd $400/oz	In parts per million (ppm), except as noted [underlined concentrations qualify as occurrences 1/]												
					Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
26p.) Meadow Creek placer:																		
310	1. 179.46 g 2. 3.68 lbs/cu yd	Recon sluice/ 0.1	.00007 (0.222 mg)	.03	<0.1	2	10	15	<5	<5	10	297	<100	1	NA	1420	2970	243
Trench 1:																		
312	1. 279.84 g 2. 2.09 lbs/cu yd	0-2/ 0.275	<.00001 (0.033 mg)	<.01	<0.1	2	12	18	<5	<5	12	172	<100	<1	NA	2400	5850	415
Trench 2:																		
313	1. 185.87 g 2. 1.39 lbs/cu yd	0-2/ 0.275	.00005 (0.420 mg)	.02	2.5	3	220	23	<5	<5	25	435	<100	<1	NA	3310	7900	580
27p.) Elk Creek placer:																		
Trench 1:																		
314	1. 353.16 g 2. 2.63 lbs/cu yd	0-2.8/ 0.275	.00012 (1.832 mg)	.05	2.8	14	60	44	30	<5	170	428	<100	2	NA	2800	6875	825
28p.) North Fork Canyon Creek (Lost Cabin) placer:																		
320	1. 214.57 g 2. 4.40 lbs/cu yd	Recon sluice/ 0.1	None	None	0.2	6	9	70	<5	<5	40	502	<100	5		1360	2930	215
29p.) Stanley Lake Creek placer:																		
Trench 1:																		
321	1. 245.91 g 2. 2.27 lbs/cu yd	0-6/ 0.222	<.00001 (0.079 mg)	<.01	0.1	14	24	36	23	<5	15	210	<100	1	NA	2600	6420	525
Trench 2:																		
322	1. 202.16 g 2. 1.51 lbs/cu yd	0-2.8/ 0.275	<.00001 (0.113 mg)	<.01	<0.1	4	7	11	<5	<5	27	440	<100	<1	NA	2250	5200	665
Trench 3:																		
323 *	1. 166.78 g 2. 1.24 lbs/cu yd	0-2.8/ 0.275	<.00005 (0.401 mg)	.02	1.9	38	15	34	5	<5	15	595	<100	2	NA	2910	7250	690
324	1. 252.93 g 2. 5.19 lbs/cu yd	Recon sluice/ 0.1	None	None	0.1	6	23	86	<5	<5	<10	418	<100	2	NA	2105	4460	240
Average concentrations from 20 samples from the study area and vicinity having significant concentrations of La, Ce, and Y:																2825	6528	611
Porter placer mine (fig. 1):																		
326	Charcoal gray, heavy mineral concentrates from stockpile.	Random composite sample			0.3	3	13	58	6	<5	45	840	<100	6	NA	2250	5540	975
1/ Threshold of occurrence concentration set at one-half of the concentration of the Porter mine concentrate sample:																1125	2770	975



Geologically, this segment of the Cape Horn Creek valley is U-shaped, and hence, has been glaciated, but it was probably not covered by the most recent and diminutive Pinedale glacial advance mapped farther east in Stanley Basin (Williams, 1961, fig. 11). Five distinct gravel benches identified above the level of the creek (fig. 23) appear to have been stratigraphically continuous prior to recent erosion. REE black sand occurrences were found in trenches 3, 4, and 5 (table 4); the lack of occurrences in trenches along the downstream portion of the prospect area may be due to a relative increase in aggradation.

Regarding the source of REE-bearing black sands, the REE concentration in Tertiary granite, common in the Copper Mountain mineralized area, is enriched by a factor of two over concentrations in Cretaceous granite and metasediment (table 1). REE is enriched within pan concentrate samples (table A-1, p. 73) from rivulets draining Copper Mountain by a factor of about 5, over concentrations in Tertiary granite (table A-3, p. 103), and is again enriched by an order of magnitude within the down-drainage Cape Horn occurrences (table 4).

Total volume of alluvium at the Cape Horn Creek placer is approximately 27 million yd^3, of which 11 million yd^3 is in the study area (east of the gravel roads which access the creek). Of the total yardage, 14.5 million yd^3 is estimated to be above creek level, and 12.5 million yd^3 is below. The yardage is almost three times the suggested minimum for an economic deposit of this type (Kiilsgaard and Hall, 1986, p. 9). The Cape Horn Creek prospect is outside the SNRA and is open to mineral entry.

Swamp, Thatcher, and Flat Creeks/Marsh Creek Placers

Most of the 2-mi-long segment of Swamp Creek extending south from Idaho Highway 17 is underlain by flood plains. The placer was located between 1951 and 1954 by W. J. Jarvis, except for the 2-claim-Leonard block at the upper end of the segment, located by H. W. Hahn in 1953. The lowest 0.7-mile-long segments of Swamp, Thatcher, and Flat Creeks in the study area cross alluvium that is actually part of the Marsh Creek flood plain. The Swamp Creek claims were an extension of the Cape Horn claims, a block of at least 18 association placer claims that blanketed the Marsh Creek flood plain and were located by Jarvis and company during the same period. The lowest reaches of Thatcher and Flat Creeks were also covered by the Jarvis claims.

The two trenches on the lower reaches of Swamp Creek (pl. 1) have the highest concentrations of REE found in the study area and are much higher in REE concentrations than the composite stockpile sample from the Porter mine (table 4, no. 327). It is likely that the black sands in these trenches were concentrated primarily by lateral migration of Marsh Creek, rather than Swamp Creek. It is likely that Marsh Creek was predominantly periglacial throughout the Pleistocene, thus more suitable for reconcentrating black sands than the middle and upper reaches of Swamp Creek, which primarily deposited glacial outwash. A reconnaissance sluice sample (pl. 1 and table 4, no. 302) taken 2 mi and one

glacial step above trench 2, at the foot of an uppermost riser, qualifies as a black sand occurrence, but is considerable lower in REE concentration than samples from the lower trenches.

Although black sand occurrences were not found along the lowest reaches of Thatcher and Flat Creeks, both lie within the Marsh Creek flood plain terrane. A reconnaissance pan sample taken along the active stream bed on lower Thatcher Creek during the initial, orientation phase of field work, did contain elevated REE concentrations (table A-1, no. 293), but a follow-up trench sample (no. 294) was low in REE, suggesting the trench intersected glacial outwash. A weak occurrence farther up Thatcher Creek (pl. 1 and table 5, no. 295), on H. W Hahn's Doris claim block, is above the Marsh Creek flood plain; the sample was taken along a reach of narrow, elongate flood plain of glacial outwash that appears well graded, and hence, permissive of reconcentration. A pan sample (table A-1, no. 303) taken from the 0.8-ft-wide dry stream bed of Flat Creek, incised 1 ft below the surface of the Marsh Creek flood plain, was somewhat elevated in REE, similar to the Thatcher Creek pan sample, and may represent a mix of retransported flood plain material and younger sediment from upper Flat Creek. Apparent differences between heavy mineral content in pan and sluice samples may reflect sample-size influence and efficiency of the sluice box sampling method.

It is the larger Marsh/Swamp Creek prospect area which could be of future economic interest for black sand mining. Volume calculations were not made for the Marsh Creek flood plain; however, examination of the Banner Summit 7.5-minute topographic map suggests the alluvial volume is at least several times the volume of the Cape Horn Creek placer. Like the Cape Horn Creek placer, the Marsh Creek placer is outside the SNRA and is open to mineral entry.

Meadow, Elk, and Stanley Lake Creeks/Valley Creek Placers

The lowest reaches of Meadow, Elk, and Stanley Lake Creeks are similar in setting to Swamp/Marsh Creek placer, in that the main black sand occurrences are limited to the lowest reaches of streams draining the study area, and the essential black sand prospect is the encompassing Valley Creek flood plain. Placer mining activity has been minor on Meadow, Elk, and Stanley Lake Creeks (see partial listing in table A-4, part 5), especially with respect to intense placering that occurred on the upper reaches of Valley Creek.

Van Noy and others (1986, plate 3) show a one-mile-long reach on Meadow and Elk Creeks and two one-mile-long reaches on the lower, southeasterly-trending segments of Valley Creek that had seen some gold placer activity. A working on lower Elk Creek (pl. 1 and fig. 24; no. 314) consists of parallel, north and south tailings berms, 600 and 650 ft long, respectively, and about 50 ft wide and 5 ft high, indicating a total volume of 8,000 yd^3 were mined. In the early 1950's the USBM churn drilled a 21-ft-deep hole on Meadow Creek and a 26-ft hole on Valley Creek for the AEC (U.S. Atomic Energy Commission), but no

resources were identified (Van Noy and others, 1986, pl. 1; Eilertsen and Lamb, 1956, p. 5).

The Meadow, Elk, and Stanley Lake Creek lower placers are within the lateral extent of the mainly Pleistocene periglacial gravel and the Recent-age flood plains of Valley Creek. Most likely, the occurrences are largely the result of concentration by Valley Creek, during its history of meandering and reworking sediments on its flood plain. REE occurrences along the lower reaches of the Valley Creek tributaries, like those in the Cape Horn and Marsh Creek areas, compare well in REE concentration to the Porter mine composite concentrate sample (table 4). Occurrences from the lower reaches of Meadow Creek are from trenches 1 and 2 (pl. 1, nos. 312 and 313). These occurrences are substantially higher grade than a third Meadow Creek occurrence (310), which is a glacial step up in elevation above the Valley Creek flood plain system.

The Elk Creek occurrence, trench 1 (pl. 1 and table 5, no. 314), also appears to be within the periglacial province of the Valley Creek flood plain system; the topography is permissive. A pan sample and a second trench sample on Elk Creek (pl. 1 and table A-1, nos. 315 and 316), a glacial step above the Valley Creek Pleistocene and Recent flood plains, has substantially lower REE concentrations. The samples were taken below Elk Meadow, a lacustrine plain representing about 10 million yd^3 of sediment. Although the alluvial volume is large enough to contain a small economic deposit, it is doubtful that significant reworking of sediment occurred in this aggradational environment.

A narrow flood plain occurs on the tread of a second step on the Elk Creek glacial stairway. A reconnaissance sluice sample was taken at the foot of the riser (pl. 1 and table A-1, no. 317); REE content was essentially the same as the second trench sample (316). The lacustrine plain is composed of homogeneous prograded alluvium (similar to sediment partially filling Stanley Lake, discussed below), which filled an ancestral lake; consequently, REE concentrations in the two samples may typify the REE concentration throughout the alluvium underlying the lacustrine plain.

On Stanley Lake Creek, black sand occurrences in trenches 1, 2, and 3 (pl. 1 and table 4, nos. 321-323) are all within the Valley Creek flood plains, and all contain REE concentrations which compare favorably with the Porter mine concentrates. Trench 3, which is 0.95 mi east-southeast of the area depicted by plate 1 map edge, is only one-third mile west of the confluence of Stanley Lake Creek and Valley Creek, in sediment mapped by Williams (1961, fig. 11) as latest Pleistocene (Pinedale).

A reconnaissance pan sample was taken a few hundred feet up Stanley Lake Creek from Stanley Lake on the lacustrine plain (pl. 1 and table A-1, no. 324). The homogeneous sediment has a slightly higher REE content than samples 316 and 317, which were taken upstream and downstream from the Elk Meadows lacustrine plain. Sample 324, like samples 316 and 317, is too low in REE to be considered an occurrence.

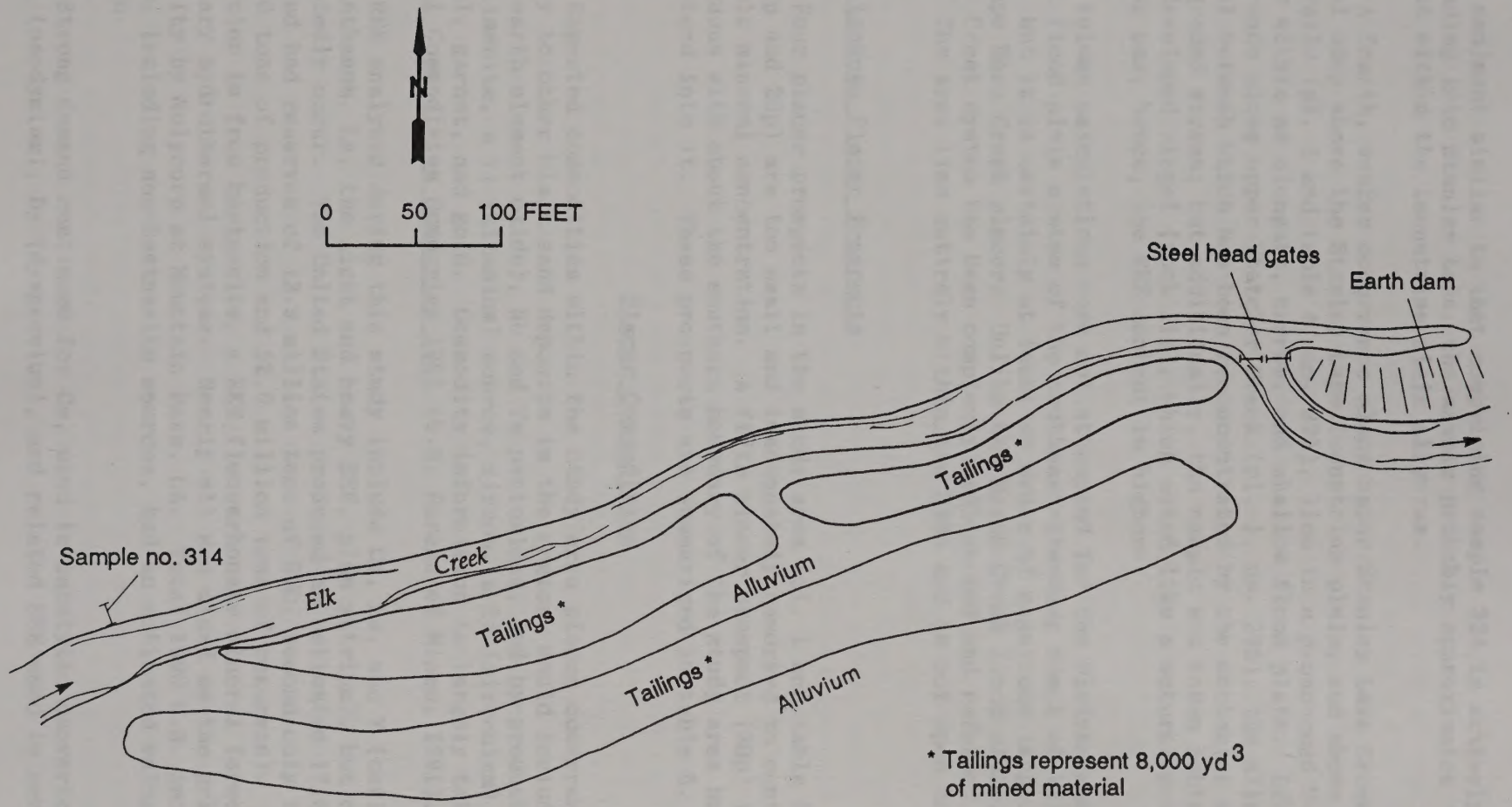


Figure 24.- Elk Creek placer workings

Since sediment similar to that comprising sample 324 is actively prograding into Stanley Lake, the sample probably approximates the REE content within the lacustrine plain alluvium.

A fourth, weaker occurrence along upper Stanley Lake Creek, a glacial step above the Stanley Lake lacustrine plain, and above Lady Face Falls (pl. 1 and table 4, no. 325), lies in a pronounced U-shaped valley within an elongate, narrow, and shallow flood plain. Like the occurrence along upper Thatcher Creek (pl. 1, no. 295), the alluvium is glacial outwash which has been reconcentrated by the mechanics of a well-graded stream; but additionally, the sample was taken behind a well-developed riegel (rock lip), which acted like a natural concentrating pan; hence, the REE content is higher.

Volume calculations were not attempted for the Pleistocene-to-Recent flood plain system of the southeast-trending reach of Valley Creek, but it is certainly at least an order of magnitude larger than the Cape Horn Creek placer. Unlike the Marsh Creek flood plain, the Valley Creek system has been complexly redissected and reformed through time. The area lies entirely within the SNRA and is not open to mineral entry.

Miscellaneous Placer Prospects

Four placer prospects in the study area (pl. 1 and table 5, nos. 23p-25p and 28p) are too small and inadequately reworked to contain economic mineral concentration. A fifth placer prospect (30p) is contiguous with about the southern boundary of the study area but does not extend into it. These prospects are summarized in table 5.

Placer Commodities

Expected commodities within the study area placer occurrences, by analogy to other black sand deposits in the region, would include REO (rare-earth-element oxide), Nb and Ta pentoxides, and by-products ThO_2, U_3O_8, ilmenite, a Ti (titanium) source, zircon, a Zr (zirconium) mineral, garnet, and gold. Commodity information is largely taken from Mineral Commodities Summaries 1991 (U.S. Bureau of Mines, 1991).

REE analyzed during this study include Ce, La, and Y (cerium, Ce, and lanthanum, La, the light and heavy REE, plus yttrium), but other REE undoubtedly occur. The United States produced an estimated 17,600 short tons and had reserves of 13.9 million tons of REO, second only to China (27,600 tons of production and 52.9 million tons of reserves). U.S. production is from bastnasite, a REE fluocarbonate mineral formed in secondary hydrothermal systems. Nearly all was mined as the primary commodity by Molycorp at Mountain Pass, CA. Total 1990 U.S. production of REO, including non-bastnasite sources, had an estimated value of $86 million.

Strong demand continued for Ce, used in catalytic converters, and for Nd (neodymium), Dy (dysprosium), and related REE used in permanent

magnets. Products containing Y were used in CRT (cathode ray tubes for colored television picture tubes and computer monitors), laser crystals, advanced ceramic parts and coatings, superalloys, emission control catalyst substrates, heating elements, synthetic garnets for electronic applications, and in gem stone simulants. Y and other REE are also being used experimentally in the development of superconductors. Exploration and development of new placer sources increased because of greater demand for Ti, used in super alloys, and Zr, used in advanced ceramics. Zircon and zirconium-bearing minerals are certified as essential to the economy or defense of the United States.

Nb (niobium), which as a commodity is commonly referred to by an alternate name, columbium, has not been mined in significant quantities in the United States since 1959, when the Porter mine closed. Columbium metal, ferrocolumbium, and other alloys and compounds are produced in the eastern and midwestern states, California, and Washington, and find end uses in the ferrocolumbian steel industry and in critical applications in the aerospace industry. Estimated U.S. consumption for 1990 is 7.4 million lbs; 24 million lbs of an estimated world production of 29.5 million lbs (excluding Chinese, Soviet, and Zambian columbium) is from Brazil; world reserves are 7.8 billion lbs. In the first half of 1990, consumption of columbium by the steel industry was down 8%, influenced by an 8% drop in the production of raw steel; total consumption remained the same because of a significant increase in super alloy applications.

Ta (tantalum) is a critical component of compounds and superalloys which find end uses in electronic components, transportation, machinery, and other applications. Ta, like Nb, has not been mined domestically since 1959, except for small unreported quantities in 1989 and 1990. Apparent U.S. consumption is small, however, less than one million lbs (500 tons), and worldwide resources are adequate. Estimated 1990 world production (excluding Chinese, Soviet, and Zambian Ta) totals 910,000 lbs, of which Australia, Brazil, and Canada produced 300, 280, and 180 thousand lbs, respectively; world reserves are 48 million tons. Total estimated value of domestic shipments of metal, alloys, and compounds (exclusive of tantalum carbide shipments) was approximately $100 million. Barton (1962) presented detailed information on columbium and tantalum.

Thorium oxide (commonly classified with REO), a radioactive by-product from REO production also has non-energy applications in ceramics, incandescent lamp mantles, magnesium-thorium alloys, refractories, welding electrodes, and other applications. The value of thorium used in these applications by domestic industry is only $1 million. Thorium use in non-energy applications is declining because of its radioactivity. In August, 1989, the only commercial domestic thorium-fueled reactor was shut down due to the costs of compliance with Federal safety regulations, and no new thorium reactors are planned. Although no alternative materials have been developed despite ongoing research, oversupply of radioactive thorium continues to grow as a by-product of REO extraction from placer minerals, causing a major disposal

or storage problem of a radioactive substance (U.S. Bureau of Mines, 1991, p. 170-180).

Evaluation

No placer resources have been identified in the Hanson Lakes study area; however, the REE occurrences suggest resources may exist adjacent to the study area along Marsh, Valley, and Cape Horn Creeks. Resources within the study area would be minor. The only substantial yardage which may host resources in the study area is 11 million yd^3 of the 27 million yd^3 of alluvium at the Cape Horn Creek placer. The Cape Horn Creek occurrences were weaker in REE concentrations than occurrences on the Marsh and Valley Creek flood plains. Resource delineation within the three black sand mineral areas largely adjacent to the study area was beyond the scope of this study.

Mining in the Marsh Creek area, which is outside the SNRA, could be done in an environmentally sensitive manner. Properly planned, dredge mining would result in an increase in wetland ponds suitable for waterfowl habitat, an example of economic growth providing the wherewithal to protect the environment (Brown, 1990).

CONCLUSIONS

The Copper Mountain mineralized area is the only one of three mineralized areas in the study area that is outside the SNRA and open to mining claim location. The area lies within the trans-Challis fault zone, a favorable setting for mineralizing processes, and contains Tertiary-age igneous rocks, which are associated with mineral deposits in the region. The Tertiary granite has a high background in, and is a potential mineral source for Au, Be, Nb, REE, and Sn. All of these elements represent commodities with advanced technological applications, and significant Nb, some REE, and Sn resources do not occur in the United States. The area is also of interest because of possible Mo, Cu, Ag, and Pb resources. Resources have not been identified, but several local areas and sites contain concentrations of gold, gold indicator elements, REE, and Mo. Near-surface disseminated deposits, mineable by open-pit methods, may occur; shear zone occurrences are of possible economic interest; the Ag-Cu-Pb skarn occurrences, though locally high grade, currently are not of economic significance.

An identified mineral resource of 366,000 tons of measured and 1,528,000 tons of indicated flake graphite resources is adjacent to the study area, within the Elk Mountain mineralized area. Mineralized area geology, however, is permissive for one billion tons of graphite resources, equal to the estimated 1990 global reserve base. Gold also occurs in the mineralized area along an apparently near-surface, granitic intrusive contact with overlying metasediment. If gold resources are identified, they may be mineable by low cost open-pit methods.

Twenty new REE occurrences, 19 placer and one hydrothermal, were found in conjunction with examination of claim blocks, mineralized areas, and prospects. The hydrothermal occurrence is in the Observation Peak mineralized area and is of special interest because, unlike placer deposits, REO can commonly be mined from hydrothermal deposits without producing radioactive Th, for which there is currently no market, and disposal is a problem.

The placer occurrences are clustered in three main areas, Cape Horn Creek, Marsh Creek, and lower Valley Creek, which are mostly outside, but circumscribe the north half of the study area. Modest resources probably occur, but unwanted Th would be a by-product. The Observation Peak mineralized area, and the lower Valley Creek mineral area, which probably contains the most placer REE resources, are entirely within the SNRA.

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APPENDICES

TABLE A-1. -- Trace-element analyses of samples from the Hanson Lakes study area, Boise and Custer Counties, Idaho

[Gold valued at a $400 per troy ounce, ppb - parts per billion, cub yd - cubic yards, ft - foot, mm - millimeter, NA - not analysed; cbl - cobble, pbl - pebble, sd - sand, slt - silt, cly - clay, org - organics; pk -pink, wt - white, grn - granite, rhy - rhyolite, maf - mafic dike, peg - pegmatite, < - less than, > - larger than, Fe stns - iron stains (% - of surfaces stained), recon - reconnaissance]

* see Table A-2 for whole rock analysis; ** insufficient sample

Sample no.	Description [magnetic/nonmagnetic (grams)]	Free Au In ounces/ cubic yard	In parts per million (ppm), except as noted													
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	B	Mo	Hg (ppb)	La	Ce	Y
PART I. -- LODE PROSPECT SAMPLES																	
FIGURE 4. -- Copper Mountain mineralized area:																	
Pan concentrate samples:																	
1	Cbl = pbl > sd > slt; 60% rhy, 25% grn (wt > pk), 10% schist/skarn, 5% quartz, Fe stns. [0.44/32.9]	None		0.3	11	27	75	12	<5	<10	187	<100	2	110	112	295	31
20	Pbl > cbl > sd > slt; 50% rhy, 25% pk grn, 15% schist/skarn, 10% quartz. [1.53/50.52]	Do....		0.4	21	31	232	8	<2	<10	302	<100	3	70	540	1250	47
36	15% cbl, 55% pbl, 15% sd, 15% slt; 60% grn, 20% rhy, 15% skarn, 5% quartz. [0.38/39.14]	Do....		0.2	28	48	320	10	<5	10	263	<100	3	105	605	1380	98
53	Pbl > cbl > sd > slt; 50% pk grn, 35% Fe-stained rhy, 10% quartz latite, 5% maf; 1% black sd. [1.00/32.9]	Do....		0.1	27	44	316	6	<5	10	260	<100	10	105	335	810	82
59	Pbl >> sd = slt > cbl; 75% pk grn, 20% maf, 5% peg; 2% black sd, minor garnet. [2.05/41.85]	Do....		<0.1	15	29	121	<5	<5	10	295	100	4	35	605	1510	125
Stream sediment samples:																	
2	Sd > pbl > slt = org; 50% pk grn, 50% rhy, Fe stns.		<5	0.1	14	36	116	<5	<5	<10	605	<100	1	<10			
3	Sd > pbl > slt = org; 60% pk grn, 40% rhy, Fe stns.		<5	0.3	21	48	135	<5	<5	<10	450	<100	2	<10			
12	Sd > pbl > slt = org; 95% pk grn; 5% maf.		<5	0.1	10	11	69	<5	<5	<10	745	<100	1	<10			
19	Sd >> pbl > slt = org; 100% pk biot/phlogopite grn.		<5	<0.1	11	11	85	<5	<5	<10	705	<100	1	<10			
21	Sd > pbl > slt = org; 60% pk grn, 40% buff rhy.		<5	0.7	40	44	350	<5	<5	10	1015	<100	2	<10			
23	pbl > sd >> slt; 80% rhy, 10% maf, 10% pk grn.		7	0.6	95	221	890	<5	<5	20	670	<100	40	<10			
25	Sd > slt = org > pbl; mainly wt grn.		5	0.2	27	46	240	6	<5	<10	975	130	2	<10			
26	Do.....		<5	0.3	34	48	260	8	<5	<10	838	120	1	<10			
27	Do.....		<5	0.1	43	46	330	7	<5	<10	702	100	1	<10			
37	Sd >> slt; 50% rhy, 50% grn, Fe stns, subrounded.		12	0.1	31	99	345	5	<5	10	502	<100	1	<10			
44	Sd > slt = pbl; 70% grn, 30% rhy; light Fe stns.		<5	0.5	27	74	217	<5	<5	<10	836	100	2	<10			
54	Sd > slt; 75% grn, 15% rhy, 5% maf, 5% peg; Fe stns.		**	0.3	43	62	535	6	<5	15	462	105	10	<10			
56	Sd = slt > pbl > org; 90% pk grn, 10% maf.		5	0.3	35	31	302	<5	<5	<10	645	125	1	<10			
57	Sd >> slt > pbl > org; 90% pk grn, 10% maf.		<5	0.1	26	27	150	6	<5	<10	618	100	<1	<10			
58	Sd = slt > org; pk grn cbl; Fe stns, well sorted.		<5	0.1	20	28	170	<5	<5	10	480	100	2	<10			

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 4. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples:																	
4	Gray fine-grained silicified, weakly calcareous metasediment; Fe-stained rinds with copper-stained gray sulfide loci; quartz veinlets. From shallow trench.	Select	<5	<0.1	4	8	60	10	<5	<10	570	<100	1	135	44	120	25
5	Silicified pk grn; 1-2% pyrite and pyrite pseudomorphs, Fe-stns along fractures; quartz veinlets. Same trench as no. 4.	Select	8	0.6	3	20	46	7	<5	<10	218	<100	1	50	37	90	8
6	Buff-colored rhy; sparse 1- 2 mm plagiocase phenocrysts; Fe-stns (7%) and spots (1%).	Grab	7	<0.2	4	35	55	5	<5	<10	248	<100	2	40			
7	Buff-colored rhy; lightly to moderately Fe-stained. Two, 2-ft diameter pits at 120 and 135 ft south along sample length.	Grab, over 360 ft	8	<0.2	5	20	49	<5	<5	<10	102	<100	1	75	<20	45	28
8	Coarse-grained to pegmatitic weakly silicified, epidotized biotite (20%) granite; Fe-stns (20%).	Grab, over 70 ft	<5	<0.2	3	11	56	<5	<5	<10	560	<100	1	70	50	128	<5
9	Buff-green rhy; slightly epidotized; moderate Fe-stns (30%) along fractures; minor limonite possibly after sulfides.	Random chip	<5	<0.1	5	5	25	10	<5	<10	130	<100	1	<10			
10	Quartz dacite dike strikes N.31°E.; weakly epidotized; weak Fe- and Mn-stns along fractures.	Do...	<5	0.1	14	7	67	<5	<5	<10	520	<100	2	10	45	115	20
11	Coarse-grained pk biotite grn, 50-70% orthoclase; weakly silicified, minor chlorite and epidote after biotite near dike contact, weak Fe-stns, no visible sulfides.	Do...	<5	0.1	16	8	24	<5	<5	<10	92	<100	1	10			
* 13	Coarse-grained pk biotite grn, 50-70% orthoclase; weakly silicified, weak Fe-stns, no visible sulfides.	Do...	12	2.2	6	39	36	7	<5	<10	132	<100	1	10	62	160	10
* 14	Pinkish-buff rhy, moderately silicified and Fe stained.	Do...	<5	0.2	28	22	128	7	<5	<10	47	<100	1	25	53	132	38
15	Do.....	Do...	<5	0.2	9	48	37	17	<5	<10	172	<100	1	15	32	80	33
16	Quartz and gouge from two subparallel fault zones.	Chip, 1 & 0.5 ft	<5	0.3	10	13	68	6	<5	<10	100	<100	1	20	45	113	34
17	Pinkish-buff rhy, moderately silicified and Fe-stained.	Random chip	5	0.5	11	102	285	<5	<5	<10	980	<100	1	20	37	88	26
* 18	Chlorite, epidote and lesser garnet tactite and lesser hornfels.	Chip 1.5 ft	<5	0.1	17	45	57	6	<5	<10	178	<100	<1	<10	<20	<10	<5

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 4. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
22	Medium- to coarse-grained pk grn; weakly silicified, heavily epidotized and chloritized; minor limonite after pyrite.	Random chip	<5	<0.1	2	5	50	<5	<5	<10	355	<100	1	<10	115	276	21
* 24	Medium- to coarse-grained wt grn.	Do...	<5	<0.1	2	3	26	<5	<5	<10	67	<100	1	<10	35	90	<5
28	Coarse-grained pk grn; silicified, chloritized and epidotized, heavy Fe-stns, limonite lines vugs after pyrite.	Do...	<5	0.2	15	29	66	<5	<5	<10	68	<100	10	20	38	112	12
29	Do.....	Grab	25	5.4	38	41	86	32	<5	<10	145	<100	20	25	45	125	10
30	Coarse-grained pinkish wt quartz monzonite; Fe-stained biotite (10%) in hairline bands.	Random chip	5	0.7	140	16	260	20	<5	15	125	<100	5	<10			
31	Epidotized calc-silicate gneiss with pinkish white concordant injection gneiss and 0.25- 0.5-in.-thick quartz veins (5%).	Chip 1 ft	<5	4.7	402	532	5600	<5	<5	125	1425	115	6	<10	37	95	25
32	Heavily epidotized calc-silicate gneiss and lesser hornfels; malachite-stains, 10% quartz veins.	Random chip	75	86	7225	710	2.5%	<5	<5	620	2450	<100	8	195	<20	30	10
33	Limonite-stained gray gneissic quartzite.	Grab	<5	<0.2	5	9	16	<5	<5	<10	52	<100	<1	10			
34	Highly epidotized grn from 5-ft-wide fault zone; potassium feldspar phenocrysts, 1/8- to 3/8-in.-long opaline quartz lenses.	Random chip	<5	<0.2	3	14	56	<5	<5	<10	245	<100	1	20			
35	Whitish pk grn; silicified and somewhat epidotized; seriate, mainly medium-grained.	Random chip	<5	<0.1	12	11	11	10	<5	<10	85	<100	<1	15	22	55	40
38	Medium-grained pk grn; thin flow bands.	Grab	<5	0.1	30	16	220	17	<5	<10	157	<100	2	<10	24	65	14
39	Medium- to coarse-grained wt grn, with 20% pk feldspar crystals; biotite is mainly altered to chlorite, foliated, Fe-stained.	Do...	<5	<0.1	11	9	71	18	<5	<10	162	<100	1	<10	20	48	6
40	Gneissic pinkish wt hornblende biotite grn (65%); pk & wt pegmatite (35%); medium- to coarse-grained brownish pk grn (15%).	Do...	<5	<0.1	7	5	42	45	<5	<10	220	100	<1	<10			
41	Calc-silicate garnet epidote skarn; ranges from very hard black calc-silicate gneiss to biotite phlogopite schist.	Chip 4 ft	10	0.6	15	213	568	12	<5	15	1020	100	1	25	35	90	13
42	Garnet calc-silicate chlorite gneiss; 1/8-in. spacing between bands; lesser (30%) remobilized porcelaneous chlorite feldspar quartz aplite.	Do...	<5	<0.1	12	22	208	<5	<5	<10	457	<100	1	<10	46	112	16
43	6.5 ft of a 10-ft-thick pegmatite vein is exposed; indistinct zones include 2/3 wt granitic and 1/3 gray quartzitic rock.	Chip 6.5 ft	<5	<0.1	14	21	43	<5	<5	<10	145	<100	3	<10	<20	<10	11

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 4. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
45	Light olive (10% pinkish) gray silicified rhy; dark metallic gray hairline veins.	Random chip	<5	<0.1	28	10	47	10	<5	<10	143	<100	1	<10	<20	45	22
46	Light bluish gray quartz dacite flow; very silicified; 1-2 mm phenocrysts altered to chlorite.	Chip 5 ft	<5	<0.1	60	18	71	12	<5	<10	202	<100	1	<10	25	65	13
47	Fine-grained bluish gray mafic dike; small vesicles, less than 2 mm across, make up to 5% of the volume.	Grab	7	<0.1	221	2	79	<5	<5	<10	905	160	1	<10			
48	Greenish buff rhy; about 45% silicified, manganese and Fe stns line 20% of joints.	Do...	<5	0.6	48	202	163	15	<5	<10	360	<100	2	<10	23	88	21
49	Mainly coarse- to medium-grained buff-pk grn occurs in a dozen small outcrops; 20% coarse to pegmatitic pk and wt grn, and 15% metasediments may be xenoliths; mafics in all facies commonly altered to chlorite and epidote.	Random chip	<5	<0.1	3	6	36	15	<5	<10	163	<100	<1	<10	30	75	58
50	Platy buff rhy; appears unaltered, Fe-stns.	Do...	<5	0.5	48	25	778	13	<5	<10	38	<100	2	15	26	72	27
51	Fine- to coarse-grained wt grn; pk feldspar phenocrysts common; weakly epidotized and foliated.	Do...	<5	0.1	14	36	146	<5	<5	<10	240	<100	2	<10	82	152	6
52	Medium- to coarse-grained wt grn; pk feldspar phenocrysts common; weakly epidotized, and foliated; moderate Fe-stns.	Do...	<5	<0.1	4	12	81	<5	<5	<10	188	100	1	<10	54	215	6
55	Quartz latite; potassium feldspar rich, but with 3-mm plagioclase phenocrysts; silicified, secondary chlorite and epidote > biotite and hornblende; possible chill zone, grades into coarse-grained pk grn up slope.	Do...	<5	<0.1	2	3	49	<5	<5	<10	342	<100	1	<10	96	225	19
PLATE 2. -- Pass Over prospect: Pan concentrate sample: [magnetic/nonmagnetic (grams)]		Free Au In ounces/ cubic yard															
63	Pbl >> cbl > sd > slt; 60% rhy, 20% grn, 15% schist/skarn (10% quartz), 5% quartz. [0.73/40.49]	None		0.6	23	92	188	15	<5	<10	325	<100	2	90	380	912	68

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 2. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted													
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Stream sediment samples:																	
83	Rhy; Fe stns; spring 15 ft above creek bed.		<5	<0.1	3	6	8	<5	<5	<10	46	<100	<1	10			
97	Sd >> pbl > slt > org; 50% grn, 40% rhy, 10% quartz.		<5	0.7	60	225	498	7	<5	12	685	<100	1	<10			
116	Sd >> pbl > slt/org; 70% rhy, 30% grn/schist, Fe stns		<5	0.4	46	182	320	8	<5	<10	512	<100	<1	<10			
Rock samples:																	
60	Weakly epidotized and silicified coarse-grained pk grn; heavy Fe stns (50%), goethite after pyrite.	Random chip	<5	1.1	80	280	290	10	<5	<10	465	<100	1	20			
61	Buff-colored rhy; limonite after pyrite in vugs and along quartz veins (to 1/4 in. thick).	Do...	<5	0.5	22	60	94	17	<5	<10	170	<100	4	25			
62	Silicified pk grn; minor biotite, heavy Fe stns after pyrite.	Chip 9 ft	45	0.1	8	32	115	8	<5	<10	262	<100	1	25			
64	Kaolinized, epidotized, and highly silicified pk grn; Fe stns, 3% limonite after sulfides. Probably from caved adit.	Select from dump	10	14	5	135	140	5	<5	<10	142	<100	21	40	25	72	<5
65	Medium-grained pk grn; silicified and weakly epidotized; manganese and Fe stns.	Random chip	<5	0.1	9	48	112	5	<5	<10	269	<100	2	<10	66	170	6
66	Coarse-grained pk grn; moderate to heavy limonite stns (50%) after biotite (10%).	Do...	<5	<0.1	3	4	24	7	<5	<10	162	<100	1	<10	112	290	10
67	Buff quartz latite; 2 mm plagioclase phenocrysts; weak epidotization; weak Fe and manganese stns.	Chip 7.5 ft	<5	0.2	9	77	118	<5	<5	<10	102	<100	1	<10	20	50	35
68	Pk to tan quartz latite; 2 mm plagioclase phenocrysts; no epidote or chlorite seen.	Chip 50 ft	<5	<0.1	9	24	39	<5	<5	<10	83	<100	1	<10	62	152	33
69	Buff to pk quartz latite; 2 mm plagioclase phenocrysts; 5-10% epidote/chlorite; 40% Fe stns, minor goethite after pyrite;	Chip 200 ft	<5	<0.1	20	50	68	<5	<5	<10	140	<100	<1	<10	43	110	35
70	Taken across shear zone (top-down): 16 in. of light green slightly chloritized and highly silicified rhyolite; followed by 2 in. of gouge and 12 more in. of rhy.	Chip 2.5 ft	<5	0.1	8	30	36	6	<5	<10	80	<100	2	10	45	105	32
71	Buff-colored rhy; Fe stns along fractures, Limonitic spots (5%) after pyrite.	Chip 7 ft	15	0.3	15	21	32	15	<5	<10	65	<100	2	10	<20	37	36
72	Light green highly silicified rhy; Fe stns along fractures, 1 in. band of heavy Fe stns along shear contact, 10% limonitic spots after pyrite, fresh pyrite on newly broken surfaces.	Chip 1 ft	<5	0.2	5	20	12	10	<5	<10	25	<100	3	10	<20	42	35
73	Medium- to coarse-grained pk grn; 50% potassium feldspar, 25% quartz and 25% plagioclase, no mafics, minor epidote.	Random chip	<5	<0.1	3	2	14	<5	<5	<10	58	<100	1	<10	<20	18	<5

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 2. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted													
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
74	Flesh pk medium-, locally coarse-grained grn; 15% biotite, Fe stns.	Do...	<5	<0.1	15	9	38	7	<5	<10	223	<100	2	<10			
75	Whitish buff rhy; moderately kaolinized, weakly silicified, Fe stns, liesegang bands, local limonite spots after pyrite, local light green epidote stns.	Chip 50 ft	<5	<0.1	3	14	33	<5	<5	<10	85	<100	3	<10			
76	Flesh pk medium-grained grn; 10% mafics, chlorite after biotite, heavy Fe and light manganese stns along fractures; pk feldspar/plagioclase = 3:1.	Chip 2.5 ft	<5	<0.1	2	5	85	<5	<5	<10	460	<100	1	10			
77	Buff-colored rhy; plagioclase and quartz phenocrysts to 2 mm long; moderate Fe, and minor manganese stns line fractures.	Random chip	<5	<0.1	4	24	15	<5	<5	<10	59	<100	<1	<10	<20	<10	43
78	Medium- to coarse-grained pk grn; silicified and epidotized, heavy Fe stns, in contact with rhy from sample site 73.	Do...	<5	<0.1	3	22	48	<5	<5	<10	175	<100	1	10	43	112	8
79	Medium- to coarse-grained propylitized grn; 15% epidote, Fe stns 10%; 30-ft-wide altered zone, fresh grn to the north and south.	Grab	<5	<0.2	8	24	137	<5	<5	<10	475	100	6	10			
80	Coarse-grained pk biotite grn; slickensides	Random chip	<5	<0.1	12	6	32	6	<5	<10	142	<100	2	<10			
81	Mainly quartz with lesser rhy matrix; 40% Fe stained.	Select	<5	0.1	11	17	262	<5	<5	<10	685	100	1	<10			
82	Coarse-grained pk grn; chlorite-lined joints 1-6 in. apart, light Fe stns.	Chip 4 ft	<5	<0.1	5	9	82	<5	<5	<10	560	<100	1	10	112	280	30
84	Coarse-grained pk grn; chlorite-lined joints 1-6 in. apart, light Fe stns; jointing appears to follow shear trend.	Chip 1-ft; 3-ft gap; 3.5 ft	<5	0.1	3	15	16	<5	<5	<10	50	<100	1	30			
85	Medium- to coarse-grained pk weakly banded grn; 10% inclusions of biotite gneiss; moderate propylitic alteration, Fe stns.	Chip 1 ft	<5	0.4	33	80	117	<5	<5	<10	263	<100	3	15			
86	Biotite gneiss, 0.5 ft adjacent sample 82, 1/32-in. lamina with 1/16-in. felsic bands 1/4- to 1-in. apart; 1.5 ft of tactite includes calc-silicates, epidote, and calcite and quartz veinlets.	Chip 2 ft	<5	2.3	101	1535	1262	<5	<5	30	850	<100	5	25			
87	Buff wt fine-grained siliceous rhy; 5% quartz phenocrysts, geothite after pyrite; Fe-stnd hairline quartz veinlets.	Chip 7.5 ft	<5	0.2	6	54	87	5	<5	<10	257	<100	1	<10	68	175	18
88	Slightly calcareous biotite gneiss; finely laminated, epidote with malachite stains.	Random chip	<5	1.0	43	245	490	8	<5	20	1750	<100	12	20	60	152	11

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 2. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
89	Buff-colored quartz latite; 2 mm plagioclase phenocrysts, joints 10% Fe-stained.	Random chip	<5	<0.2	4	19	44	<5	<5	<10	50	<100	1	90	22	60	38
90	Buff-colored rhy dike cuts older gneiss; strike N. 50°E., dip 84°SE, but stair-steps up toward the north (fig. 5).	Chip 2 ft	<5	0.4	24	24	50	12	<5	<10	125	<100	4	<10	65	168	25
91	Biotite gneiss (80%) and lesser gneissic quartzite (20%) cut by dike (sample 84); foliation strikes N.67°E., dips 56°NW; 1/2-in. open-space-filled quartz veins; N. 82° E.-striking fault cuts gneiss, dip 83°SW.	Chip 6 ft	<5	1.1	49	230	292	7	<5	<10	820	<100	2	15	32	80	23
* 92	Light buff-colored rhy; Fe stns on surfaces and along fractures; trace of fine-grained sulfides with limonite after pyrite.	Random chip	<5	<0.2	9	10	28	<5	<5	<10	155	<100	2	45	23	60	28
93	Dark grayish green quartz dacite porphyry; relatively few mafics.	Do...	8	0.3	24	20	127	18	<5	<10	592	<100	5	15			
94	Medium- to coarse-grained pk to brown grn; variously epidotized, silicified, chloritized, and kaolinized (minor). In two segments on either side of dike (no. 87).	Chip 200 ft	<5	0.3	6	18	48	<5	<5	<10	275	<100	2	20	40	102	25
95	Medium- to coarse-grained pk grn; silicified and highly epidotized and chloritized.	Grab over 200 ft	<5	<0.2	11	28	67	<5	<5	<10	420	<100	3	<10	60	156	8
96	Fresh medium-grained biotite hornblende granodiorite; mafic rich, minor epidote and Fe stns.	Grab	<5	0.2	30	35	196	<5	<5	<10	695	180	3	10			
* 98	Buff-colored rhy; kaolinized.	Random chip	<5	<0.2	4	13	42	<5	<5	<10	147	<100	6	<10	42	118	22
* 99	Quartz biotite schist -- formed in fault zone -- strike N. 37°W., dip 90°.	Chip 1 ft	<5	<0.2	6	22	162	<5	<5	<10	425	195	5	15	50	123	16
* 100	Pegmatitic wt grn; few mafics, subgraphic; Joints and foliation strike N74°E, dip 84°NW.	Random chip	<5	0.8	16	26	36	7	<5	<10	72	<100	2	<10	<20	45	7
101	Fine-grained epidote-rich skarn; lesser garnet, 1/4- 1/2-in.-thick veinlets of quartz and calcite; in fault contact with potassium feldspar-rich grn in hanging wall; slickensides indicate thrusting.	Do...	<5	<0.2	8	34	130	<5	<5	<10	560	<100	3	10			
* 102	Fine- to medium-grained wt grn; Fe- and manganese-stained and epitodized; crops-out for 40 ft south of mafic dike.	Do...	<5	<0.2	10	16	41	<5	<5	<10	152	<100	4	20	45	116	5
* 103	Dark grayish green medium-grained mafic dike; epidote, hornblende, magnetite, and and wt plagioclase.	Do...	<5	0.8	101	27	635	<5	<5	10	448	100	2	10			

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 2. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted													
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
104	Pale green latite; moderate to heavy Fe stns (40%); quartz veinlets up to 1/4-in.-wide, open-space-filled veins commonly exhibit quartz crystals; minor epidote stains; 5% marcasite after pyrite; may be a zone of normal tensional faulting.	Chip 50 ft	<5	0.4	14	20	70	<5	<5	<10	212	<100	10	<10	20	55	15
* 105	Pale green latite; highly silicified and very hard, resembles quartzite.	Chip 300 ft	<5	1.2	11	14	17	<5	<5	<10	55	<100	9	70			
106	Highly silicified pk grn; feldspars are cloudy from sericite or kaolinite, chlorite and epidote common; Fe stns coat fractures and form pseudomorphs after pyrite.	Select	<5	0.2	5	12	49	<5	<5	<10	405	<100	2	<10	57	150	15
107	Medium- to very coarse-grained pk grn; varies from low mafics to 15% biotite and secondary chlorite, Fe stns cover 25% of surfaces; chill zone rhy, with 1-5 mm plagioclase phenocrysts and liesegang bands make up 20% of sample.	Chip 250 ft	<5	<0.2	10	13	42	<5	<5	<10	1805	<100	2	<10	235	605	135
108	West to east: 20 ft of grn pegmatite, 65% milky quartz, abundant potassium feldspar; 35 ft of very coarse-grained to pegmatitic grn containing 35% quartz, minor phlogopite and biotite are common; NE-trending and steeply dipping foliation.	Grab over 55 ft	<5	<0.2	8	10	34	<5	<5	<10	190	<100	4	<10	30	82	<5
109	Very heavily Fe-stained medium-grained mafic phase grn; very friable and deeply weathered, possibly a mafic dike.	Chip 35 ft	<5	<0.2	135	2	95	<5	<5	<10	752	<100	7	<10			
110	Medium- to coarse-grained (70%) to pegmatitic grn; intensely altered to chlorite and epidote after biotite.	Chip 186 ft	<5	<0.2	31	9	64	<5	<5	<10	170	<100	2	<10			
111	Greenish buff rhy; limonite stns on joints, goethite blebs after sulfides 1 mm across.	Chip 550 ft	<5	0.2	28	12	165	6	<5	<10	118	<100	4	10	52	138	42
* 112	Do.....	Chip 700 ft	<5	1.8	78	9	287	<5	<5	<10	80	<100	4	20	<20	40	31
* 113	Medium- to coarse-grained pk grn; epidotized; chlorite, jarosite, limonite-stns.	Chip 100 ft	<5	0.3	51	15	375	<5	<5	<10	268	<100	3	40	68	172	<5
* 114	Buff-colored rhy; limonite stns along fracture surfaces, moderately epidotized and slightly silicified.	Chip 670 ft	<5	<0.2	8	12	70	<5	<5	<10	40	<100	2	10	22	57	35
* 115	Grayish wt rhy, weathers to pinkish wt; porcelaneous, greenish mica.	Random chip	<5	<0.2	7	17	70	<5	<5	<10	57	<100	4	<10	<20	<10	47
117	Medium-grained quartz monzonite; heavy limonite stns, minor manganese stns.	Grab	<5	<0.2	23	18	26	12	<5	<10	106	<100	3	20			

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 2. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
* 118	Fine-grained biotite gneiss (3.5 ft) and quartzite/biotite quartz gneiss (4.5 ft); 1/8- to 1-in.-wide wt grn stringers parallel foliation (1-ft stringer not sampled).	Chip 9 ft	<5	<0.2	6	9	32	<5	<5	<10	120	<100	2	<10			
119	White granitic stringers and lesser quartzite containing very fine-grained blebs of a gray-black soft mineral; quartzite is greenish gray due to calc-silicates.	Select	<5	<0.2	15	11	26	<5	<5	<10	70	<100	1	<10	<20	36	13
120	Medium-grained (locally coarse-) clean wt grn; 5-10% biotite and hornblende; minor Fe stns.	Chip 4 ft	<5	<0.2	7	8	19	<5	<5	<10	73	<100	2	<10	75	190	10
* 121	Coarse-grained flesh pk grn; Fe stns along fractures; 5% chlorite, minor biotite, in contact with metacarbonate (site 116).	Chip 2 ft	<5	<0.2	3	6	15	20	<5	<10	72	<100	2	<10	25	75	6
* 122	Carbonate metasediment containing siderite, calcite and quartz.	Chip 3 ft	<5	<0.2	10	9	50	8	<5	<10	415	<100	3	10	<20	25	15
* 123	Coarse-grained pinkish wt biotite quartz monzonite; surface 25% limonite-stained.	Chip 8 ft	<5	0.2	17	10	39	17	<5	<10	110	<100	5	<10	23	60	10
* 124	80% gneissic quartzite and 20% quartz phyllite; epidote and Fe stns on fractures.	Chip 5 ft	<5	0.2	7	13	40	10	<5	<10	268	<100	4	<10	<20	40	16
125	Interbedded biotite schist and quartzite; minor quartz monzonite; limonite lines tiny vugs in quartzite along fault.	Chip 0.67 ft	<5	<0.2	3	14	34	5	<5	<10	283	<100	2	<10	<20	<10	<5
* 126	Medium-grained fresh biotite hornblende granodiorite; mafic rich, minor epidote and Fe stns.	Grab	<5	0.2	30	35	196	<5	<5	<10	695	180	3	10			
127	Wt to buff rhy; abundant potassium feldspar and epidote, moderate to heavy Fe stns along fractures.	Chip 40 ft	<5	0.7	55	137	277	8	<5	<10	162	<100	2	65	35	90	19
128	Medium-grained pk grn; Fe stns; flow bands strike N. 65°E., dip 74° SE.	Chip 8.5 ft	<5	0.2	16	46	312	8	<5	<10	602	135	1	10	27	68	30
129	Whitish buff rhy; abundant 1-2 mm quartz phenocrysts; liesegang stns; 50% kaolinized and 20% with tiny limonite speckles after sulfides.	Chip 90 ft	<5	0.2	5	35	62	<5	<5	<10	80	<100	3	120	25	65	19
130	Fine- to medium-grained pk grn; kaolinized; little to no mafic minerals.	Random chip	<5	0.1	19	14	148	5	<5	<10	443	100	<1	45	25	65	21
131	Garnet epidote quartzite skarn; 5-7% malachite, and minor azurite stns.	Do...	67	63	7120	2.3%	1.5%	<5	<5	340	3600	<100	4	30			
132	Greenish gray to lighter grayish green lit-par-lit 1/4- to 2-in.-wide grn lenses.	Do...	<5	<0.2	8	37	76	<5	<5	<10	262	<100	4	<10			

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 2. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted													
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
133	75% gray quartzite and 25% lit-par-lit 1/4- to 2-in.-wide wt grn stringers.	Chip 8 ft	5	3.2	270	110	1.3%	6	<5	265	2780	<100	8	25	23	60	8
134	75% gray quartzite and 25% lit par-lit-1/4- to 2-in.-wide wt grn lenses. Granitic lenses cut foliation along joint planes.	Chip 5 ft	5	0.4	8	38	61	<5	<5	<10	150	<100	4	15	27	80	8
135	Silicified metacarbonate; silicified and Fe stained, siderite effervesces; 20-ft-wide northeast-trending zone	Grab	<5	<0.2	8	34	132	<5	<5	<10	960	<100	15	30	<20	22	13
* 136	Fine- to medium-grained biotite granite dike; heavy Fe stns.	Chip 1 ft	<5	1.1	107	32	56	<5	<5	<10	114	<100	2	6875			
* 137	Light gray sugary quartzite; abundant epidote stns; locally, drusy quartz fills 1- to 2-in.-wide vugs.	Chip 5 ft	<5	0.2	11	62	72	<5	<5	<10	146	<100	5	10			
* 138	Garnet epidote quartz skarn; malachite stns in quartzitic zones.	Chip 8 ft	8	11	722	1.3%	1.4%	<5	<5	320	2050	<100	4	30	<20	20	5
* 139	Silicified carbonate; heavy Fe stns, 5-10% malachite stns; across faults in pit.	Chip 2 ft	1235 (0.036 oz Au and 5.7 oz Ag/ton)	195	2635	2300	2155	17	15	37	865	<100	17	3150	<20	17	11
140	Highly silicified mylonitic grn; 75% of surfaces Fe-stained; 10-15% stockwork of 1/8- to 1/4-in.-thick calcite veins; minor malachite.	Chip 8 ft	5	7.8	82	150	1350	<5	<5	27	1060	<100	8	210			
* 141	Highly silicified biotite grn; heavy Fe and manganese stained; 3-5% of surfaces malachite stained, 5% siderite.	Random chip	8	70	2970	2.3%	1.5%	5	<5	370	1980	<100	7	95	<20	15	8
142	Medium-grained weakly to moderately propylitized quartz monzonite.	Grab	<5	<0.2	30	19	197	<5	<5	<10	118	<100	3	<10			
* 143	Coarse-grained foliate wt quartz monzonite; minor hornblende; epidotized.	Random chip	<5	0.8	28	134	136	<5	<5	<10	180	<100	8	<10			
FIGURE 7. -- Upper caved adit, Pass Over prospect:																	
144	Propylitically altered granitic mylonite; greenish wt, with pink feldspar and heavy Fe stns along slips and fractures.	Chip 54 ft	<5	8.7	199	5320	5575	5	<5	120	605	<100	5	25	28	65	10
145	Greenish gray tactite; relict dynamic metamorphic foliation with contact metamorphic calc-silicate minerals, quartz, calcite, dark gray sulfides and heavy Fe stns.	Chip 7.4 ft	<5	52	3190	1.8%	3.6%	5	<5	950	1.3%	<100	1	310	68	170	10

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 7. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
146	Medium-grained flesh-colored to wt grn; no biotite - chlorite and epidote only.	Chip 16 ft	<5	0.8	52	245	615	6	<5	12	345	<100	4	15	45	123	19
147	Greenish gray tactite; relict dynamic metamorphic foliation with contact metamorphic calc-silicate minerals, quartz, calcite, dark grey sulfides and heavy Fe stns.	Chip 2.5 ft	<5	25	3520	2.0%	2.6%	<5	<5	450	8620	<100	12	45	25	61	19
148	Do.....	Chip 3.3 ft	5	525	9.5% (15.3 oz Ag/ton)	2.6%	2.2%	5	<5	335	6850	<100	10	35	<20	32	18
* 149	Chip trace dips 25° north to south: first 2.8 ft is porcelaneous greenish wt calc-silicate meta-carbonate; second 2.2 ft is a banded epidote-garnet tactite with a 0.3-ft-thick metallic gray sulfide band.	Chip 5 ft	<5	60	2760	4480	5880	5	<5	112	4800	<100	15	10	65	162	55
150	Sample ranges from foliated calc-silicate gneiss to unfoliated tactite.	Grab	<5	45	6200	1.6%	2.0%	<5	<5	330	6010	<100	20	<10	<20	43	18
151	Malachite stained tactite and quartz from small stockpile.	Select grab	<5	102	3.1%	2.4%	2.8%	<5	<5	440	6280	<100	8	10	<20	22	8
152	Coarse-grained to pegmatitic epidotized and silicified wt grn; Fe stns after biotite.	Chip 1 ft	<5	0.6	67	283	590	8	<5	12	880	<100	2	35	25	65	5
153	Tactite; Fe stns along fractures.	Chip 2 ft	<5	14	445	9450	4265	20	<5	165	6310	<100	22	10	<20	25	8
154	Light-gray calcareous meta-carbonate gneiss (75%) with grn injection gneiss (25%), which both cuts and pinches-out along, foliation.	Chip 7.8 ft	<5	0.5	63	142	510	8	<5	10	950	<100	3	<10	<20	37	16
155	Calcareous biotite chlorite gneiss.	Chip 3 ft	<5	<0.1	14	32	198	6	<5	<10	580	<100	1	55	<20	32	18
156	Pk gneissic quartzite; locally granitoid.	Chip 2.5 ft	<5	7.5	650	3780	4980	5	<5	98	3600	<100	95	75	22	55	11
157	Medium- to coarse-grained pk epidotized biotite gneiss; 1 ft of strongly foliated, and 5 ft weakly foliated injected grn.	Chip 6 ft	<5	0.6	101	170	515	10	<5	10	525	<100	2	<10	<20	40	18
158	Buff-colored rhy; 1-2 mm feldspar phenocrysts; light Fe stns along fractures.	Random chip	<5	0.2	10	28	60	10	<5	<10	178	<100	3	20	50	118	39
159	Calcareous and silicified metasediment (70%), and biotite chlorite tactite (30%).	Chip 10 ft	<5	0.8	42	305	428	5	<5	12	2420	<100	90	<10	<20	32	18

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

Sample no.	Description	Sample type	In parts per million, except as noted													
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
FIGURE 10. -- Small adit, Pass Over prospect:																	
Rock samples -- continued:																	
160	Garnet quartz epidote tactite; minor malachite stains.	Chip 6 ft	<5	4.6	105	4430	1.3%	<5	<5	250	5025	<100	5	55			
161	Quartz garnet epidote tactite; minor malachite stains; 0.3 ft of gouge.	Chip 2 ft	<5	38	2165	2.5%	1.4%	<5	<5	325	3520	<100	3	30	<20	37	16
FIGURE 11. -- North face open cut, Pass Over prospect:																	
162	One-ft of gouge and 1.5 ft of sheared and heavily iron and manganese stained grn.	Chip 2.5 ft	<5	0.5	38	33	320	10	<5	<10	698	<100	<1	35	50	132	25
163	Iron stained fault gouge and minor micaceous granite clasts.	Chip 2.8 ft	<5	0.3	21	20	232	8	5	<10	645	105	<1	75	38	100	31
164	Quartz epidote garnet tactite.	Chip 14.5 ft	<5	0.7	64	178	550	5	<5	10	878	<100	1	175	<20	40	60
165	Do.....	Chip 30 ft	<5	18	885	4875	6950	6	<5	132	3800	<100	8	115	<20	52	63
166	Do.....	Select	<5	5.6	1580	685	3.3%	10	<5	380	1565	260	12	10	22	58	18
FIGURE 13. -- Blue Jay prospect:																	
167	Foliated green metasediment; epidote-, calcite-, some biotite-rich layers, and 1-in.-thick quartz veins; very fine pyrite pyrite, galena; weathering-ribbed surface.	Chip 4.2 ft	5	16	335	1.7%	1.3%	20	<5	320	1475	<100	10	40			
168	Buff-colored to pink potassium feldspar-rich rhyolite; Fe stns, slightly epidotized; no visible sulfides, weak manganese staining.	Random Chip	<5	0.3	21	90	192	47	<5	<10	178	<100	1	20			
169	Epidote calc-silicate tactite; calcite, minor garnet and quartz veins, malachite stains, galena, chalcopyrite, and pyrite; from small stockpile, <10% mineralized grn.	Select grab	18	85	7425	170	3.3%	5	<5	905	4680	<100	20	80			
170	Sulfide-rich, highly epidotized tactite; about 10% bornite, 3-5% pyrite, and minor chalcopyrite.	Chip 1.8 ft	18	46	2210	1.8%	1.9%	<5	<5	340	3850	<100	18	45	20	50	19
171	Highly silicified foliated pk grn; as much as 10% biotite along folia; minor rafted inclusions of metasediments.	Chip 4.5 ft	<5	0.7	36	268	342	<5	<5	<10	288	<100	1	10	60	152	11

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 13. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
172	Quartz biotite gneiss (metasediment); Fe stns, no sulfides observed.	Chip 2.1 ft	<5	0.3	47	58	156	<5	<5	<10	380	130	1	10	82	205	46
173	Epidote tactite in contact with pk grn; minor garnet, minor bornite and pyrite; radiating calc-silicate needles nearby (not in sample); moderate/heavy Fe stains.	Chip 1.5 ft	<5	1.8	160	1275	4180	<5	<5	70	4230	110	6	15	26	65	21
FIGURE 14. -- Blue Jay prospect - continued:																	
174	Weakly foliated tanish green quartzite; Fe and manganese stns along fractures, minor dendrites.	Chip 3.5 ft	<5	0.7	106	11	1390	32	<5	32	238	<100	2	35	35	75	20
175	Very silicified, epidote tactite; malachite stains; apparent high specific gravity indicates high sulfide content.	Chip 2 ft	<5	6.7	1572	15	1.6%	<5	<5	305	1560	110	12	15			
176	0.3 ft of tactite, 2 ft of mineralized quartzite, and 1 ft of weakly mineralized quartzite; all facies are very silicified and heavy; Fe and malachite stns along fractures; bornite and sphalerite; local granitic pods in quartzite.	Chip 3.3 ft	7	30	3230	55	2.5%	5	<5	235	3240	<100	10	20	48	120	23
177	Dark green calc-silicate epidote tactite; calcite, minor garnet, abundant sulfides in more silicified material, malachite.	Chip 1.7 ft	45	116	1.1%	52	6.0%	32	<5	1810	3530	<100	75	150			
178	Silicified, garnetized, weakly epidotized K-spar-rich coarse-grained grn; subfoliate.	Chip 2.7 ft	17	33	2540	430	9050	<5	<5	190	2450	50	5	80			
179	Highly silicified and epidotized quartzite or grn gneiss; 2% pyrite, and minor galena, malachite and chalcocite.		<5	0.7	202	23	1385	<5	<5	16	725	50	2	20			
180	Highly silicified epidotized grn; medium- to coarse-grained; local gouge & sulfides.	Chip 4.6 ft	<5	0.2	34	33	143	<5	<5	5	218	50	3	15			
181	Similar to 176, but darker green and more deeply weathered; grn above and below.	Chip 2.9 ft	95	118	8810	110	3.4%	10	<5	1150	2610	<100	25	135			
182	Greenish calc-silicate-rich tactite; sulfides include galena, pyrite and chalcopyrite; heavy Fe and manganese stns; heavy.		10	112	7750	2880	2.8%	6	<5	1130	6750	<100	40	100			
183	Dark green epidote tactite; chalcopyrite, galena and pyrite; tactite sandwiched between grn; minor clay gouge.	Chip 5.6 ft	162	180	2.0%	84	3.7%	132	<5	1960	3450	<100	30	170			
184	Brownish gray quartzite; minor lithic components and Fe stns on fractures; hard.	Chip 24 ft	5	0.4	64	20	387	28	<5	<10	395	<100	1	65			

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 14. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted													
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
185	Brownish gray quartzite; minor lithic components and Fe stns on fractures; hard.	Random Chip	<5	0.2	36	6	230	30	6	<10	160	<100	1	45			
186	Do.....	Do...	<5	0.3	69	8	195	15	<5	<10	322	<100	1	20			
187	Grayish green medium-grained silicified graywacke; minor Fe stns along fractures.	Chip 4 ft	8	0.3	47	13	450	90	<5	10	270	<100	2	40			
188	One-ft of brown gouge, with kaolinized potassium feldspar, is sandwiched by 2, 0.5-ft lengths of pk grn; grn is coarse-grained, intensely propylitized and somewhat silicified pk grn; 20-30% mafics (mainly biotite); Fe stns (20%).	Chip 2 ft	5	0.1	14	12	168	33	<5	<10	223	<100	1	30			
189	2.5 ft of brown gouge is sandwiched by two 0.8-ft lengths of pk grn; grn is coarse-grained, intensely propylitized and somewhat silicified pk grn; 20-30% mafics (mainly biotite); Fe stns (65%).	Chip 4.1 ft	5	1.0	114	16	990	35	<5	22	365	<100	1	50	52	133	8
FIGURE 15. -- Elk Mountain Mineralized area, including the Gold Coin:		Free Au In ounces/ cubic yard															
Pan concentrate samples:																	
191	20% pea gravel, 50% coarse sd, 30% fine sd & slt; 60% pk grn & peg, 20% gneiss, 20% maf.	None	740 (0.022 oz/gold ton)	<.1	9	9	29	5	<5	<10	405	<100	<1	NA	865	1860	350
199	Pea gravel > sd > slt > cly > org; 50% pk grn, 20% dacite porphyry, 20% maf, minor vein quartz.	Do....	1450 (0.042 oz/gold ton)	20	10	7	31	6	<5	<10	510	<100	<1	NA	1725	4210	325
Rock samples:																	
190	White foliated arkosic quartzite.	Grab	<5	<0.1	6	6	24	20	5	<10	42	<100	<1	<10	<20	<10	<5
192	Highly silicified and slightly epidotized quartz monzonite; feldspar is altered to clay, but masked by silica; 30-50% of surfaces and fractures are coated by Fe stns.	Grab	<5	<0.1	5	4	20	125	<5	<10	58	<100	<1	<10	28	67	10
193	From top of mountain, medium- to coarse-grained propylitized and silicified quartz monzonite; 30-50% Fe stns.	Random chip	<5	<0.1	5	2	19	35	<5	<10	97	<100	1	<10	34	92	5

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 15. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
194	Greenish, gneissic metasediment float; concordant quartz veinlets; powdery limonite after fine sulfide; grn attached to gneiss.	Select grab	<5	<0.1	3	20	95	12	<5	<10	417	<100	1	10	61	150	25
195	Coarse-grained grn float; minor chlorite an biotite; somewhat silicified; Fe stns and Fe oxide pseudomorphs of pyrite.	Grab	<5	<0.1	15	13	16	<5	<5	<10	102	<100	2	<10	<20	35	5
196	The top 2 ft of sample is milky quartz, followed by 4 ft of graphitic and gneissic quartzite; 5- to 10-in.-long concordant stringers of graphite; weak Fe stns.	Chip 6 ft	<5	<0.1	6	10	32	25	<5	<10	180	<100	1	<10	<20	38	5
197	Graphitic gneiss; graphite (30%) occurs along foliation; minor limonite after sulfides in quartzose lamina.	Select grab	<5	<0.1	33	25	310	28	<5	<10	99	<100	3	<10	35	95	19
198	Medium- to coarse-grained propylitically altered grn.	Grab	<5	<0.1	16	4	45	17	<5	<10	150	<100	1	<10	50	128	15
FIGURE 16. -- Shorty prospect:																	
200	Sericitized and silicified grn; minor garnet.	Select	<5	<0.1	6	9	6	5	<5	<10	85	<100	1	<10	<20	43	53
201	Sericitized (cloudy feldspars) and silicified grn; grades into gneiss; chlorite after biotite; Fe oxide pseudomorphs of pyrite; quartz veinlets (<10%).	Select	7	0.6	16	18	52	<5	<5	<10	84	<100	<1	10	<20	40	10
202	Interlaminated gneissic quartzite and biotite schist, with pk injection grn; weak silicification; Fe stns after biotite.	Random Chip	<5	<0.1	30	7	107	<5	<5	<10	186	<100	5	<10	<20	38	23
203	Dark graphitic quartzite; minor quartz veinlets; very sparse, fine pyrite.	Select	10	0.1	7	16	121	<5	<5	<10	253	<100	1	10	20	52	14
204	Greasy feeling graphitic quartzite.	Select grab	7	2.7	158	204	510	8	<5	10	218	<100	2	15	22	55	15
205	Wt vein quartz; pyrite, bornite, and malachite and Fe stns; country rock is graphitic quartzite gneiss.	Do....	10	41	6605	310	2800	30	<5	57	35	<100	40	70	<20	15	<5
206	Schistose biotite quartzite; minor graphite and Fe stns.	Grab	<5	1.2	56	59	472	5	<5	10	98	<100	5	15	<10	25	24
207	Wt vein quartz; Fe stns along fractures; vein is at least 8 ft wide.	Random chip	5	0.3	30	10	43	6	<5	<10	50	<100	1	10	<20	22	<5
208	Epidotized grn; Fe stns; locally muscovite-bearing.	Select grab	<5	<0.1	6	14	58	<5	<5	<10	128	<100	1	<10	27	70	25

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 16. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
209	Locally sericitized (cloudy feldspars), silicified grn; heavily Fe and manganese stained along fractures; uncommon Fe oxide pseudomorphs of pyrite; quartz veins <10%.	Select	10	0.7	22	58	38	15	<5	<10	195	<100	2	10	25	63	10
210	Geothitic boxwork of weathered thin seams of sulfide-rich quartz veinletts with attached pieces of phyllitic country rock.	Select grab	3240 (0.095 oz gold/ton)	157	85	2820	705	120	<5	18	45	<100	2	180	<20	23	28
211	Vein quartz and highly silicified grn; pyrite and pseudomorphs after pyrite, geothite boxwork, minor malachite stns and small crystal-lined vugs.	Do....	335 (0.01 oz gold/ton)	27	225	118	252	102	<5	<10	56	<100	4	35	<20	25	10
FIGURE 17. -- Stanely Ace prospect:																	
212	Quartz vein; heavy Fe stns, minor muscovite and sericite, local Fe oxide pseudomorphs after pyrite, and locally vuggy.	Chip 3 ft	43	0.3	13	6	38	2195	5	<10	25	<100	1	10	180	435	43
213	Vein quartz; visible pyrite, arsenopyrite, and a dark gray sulfide. occur in gray seams and Fe-stained vugs.	Select grab	3860 (0.113 oz gold/ton)	2.3	39	14	22	10%	45	<10	20	<100	2	115	<20	<10	<5
214	Milky quartz vein; Fe stns on fracture surfaces, uncommon Fe oxide pseudomorphs after pyrite, minor vugs and gray quartz.	Chip 1.6 ft	<5	0.7	31	79	22	22	<5	<1	30	<100	1	10	<20	32	5
215	Wt quartz vein; Fe stns along fractures and in small blebs, minor vugs.	Chip 4.6 ft	15	0.5	58	40	195	250	<5	<10	54	<100	3	10	<20	30	<5
216	Medium-grained to pegmatitic biotite grn; Fe stained surfaces.	Chip 2.5 ft	<5	<0.1	9	6	330	33	<5	<10	201	<100	1	<10	83	218	33
217	Medium-grained to pegmatitic biotite grn; Fe stained surfaces, quartz veinlets (< 10%), muscovite and sericite associated with quartz veinlets.	Random 30 ft	25	<0.1	10	7	63	225	<5	<10	198	<100	1	10	52	137	33
218	Medium-grained to pegmatitic biotite grn; Fe stained surfaces, quartz veinlets (< 20%), muscovite and sericite associated with quartz veinlets; from vein footwall.	Chip 2.3 ft	<5	<0.1	23	15	742	65	<5	15	245	<100	2	<10	110	290	26
219	Clean, massive milky quartz; minor vugs, Fe stns along fractures, and gray pods and streaks (grn xenoliths in vein); muscovite and sericite near grn contact.	Chip 10 ft	<5	1.4	8	9	66	130	<5	<1	36	<100	<1	<10	<20	25	<5
220	Wt quartz vein; Fe stns along fractures and in small blebs, minor vugs.	Chip 2.6 ft	<5	<0.1	4	4	5	120	<5	<10	40	<100	1	10	<20	<10	<5

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 17. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples - continued:																	
221	Wt quartz vein with 0.6 ft of silicified grn; Fe stns on fracture surfaces; minor Fe oxide pseudomorphs after sulfides.	Chip 4.3 ft	5	<0.1	32	3	8	122	<5	<10	45	<100	3	10	<20	<10	<5
222	Cream colored muscovite grn, injected into foliated grn; feldspar phenocrysts, weak Fe stns, and minor Fe oxide pseudomorphs after pyrite.	Chip 2.3 ft	<5	<0.1	7	13	24	50	<5	<10	66	<100	<1	<10	22	57	25
223	Cream colored biotite gneissic biotite quartzite; injected by grn (site 218); Fe stns after biotite, Fe oxide pseudomorphs after pyrite, and quartz veins.	Random 3.7 ft	<5	<0.1	23	4	20	30	<5	<10	205	<100	1	<10	30	75	21
224	Heavily Fe stained biotite quartz gneiss; minor cream colored grn.	Chip 1.8 ft	<5	0.1	32	5	30	32	<5	<10	140	<100	1	<10	42	110	20
225	Silicified, Fe stained biotite rich metasediment with quartz veinlets; road float.	Select grab	<5	0.4	60	13	80	33	<5	<10	133	<100	2	15	32	85	<5
226	Fine- to medium-grained cream colored grn; minor biotite, muscovite and sericite, and Fe oxide blebs and pyrite pseudomorphs.	Do....	<5	0.1	13	16	34	46	<5	<10	72	<100	1	<10	40	102	8
227	Cream colored grn peg; minor Fe stns.	Do....	<5	0.1	16	7	52	45	<5	<10	83	<100	1	10	33	80	21
228	Gray gneissic quartzite; finely disseminated sulfides, heavy Fe stns on fractures.	Do....	<5	<0.1	29	8	24	30	<5	<10	38	<100	4	<10			
229	Grn peg; salmon to pk colored feldspar, dark green mica, Fe stained blebs, and epidote on fracture surfaces.	Select grab	<5	<0.1	7	15	22	30	<5	<10	50	<100	2	<10			
FIGURE 18. -- Observation Peak mineralized area, including the Greenback mine, Observation peak prospects, and locality of the Olympic prospect:																	
230	Milky vein quartz from irregular, 0.3- to 0.7-ft-thick veins in a 1-ft-thick zone of quartz (60%) and epidotized granodiorite.	Select chip	5	14	5	445	79	55	<5	<10	122	125	3	15	<20	38	5
231	Epidotized granodiorite; 10% vein quartz; zone 3 ft thick perpendicular to foliation.	Chip 4 ft	<5	0.2	10	26	66	60	<5	<10	295	<100	1	<10	32	80	13
232	Massive, > 3.8-ft-thick milky quartz vein trends N. 27°E., dips 85°NW; Fe-stns, dump.	Select grab	37	35	8	1480	330	185	<5	12	27	<100	6	30			
* 233	Medium- to very coarse-grained biotite (10%) quartz monzonite; locally pegmatitic.	Random chip	10	0.4	10	41	32	8	<5	<10	152	<100	4	15			
* 234	Epidotized quartz monzonite (60%); 1/4- to 1/2-in.-thick quartz veins (40%); Fe stns.	Select grab	15	16	7	620	145	30	<5	<10	43	<100	15	<10	<20	<10	<5
235	Milky quartz vein from pit 200 ft north of main adit; heavy Fe stns.	Chip 6 ft	450 (0.013 oz gold/ton)	305	6	950	30	127	<5	<10	32	<100	2	135	<20	30	<5

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 18. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
* 236	Silicified quartz monzonite; quartz veinlets, Fe stns; from main shaft stockpile.	Grab	57	1.7	6	82	25	8	<5	<10	141	<100	4	10	<20	35	12
237	Fe-stained milky quartz; 2 mm limonite pseudomorphs of pyrite; shaft stockpile.	Select grab	38	27	5	1030	37	183	<5	<10	32	<100	13	20			
* 238	Silicified, epidotized biotite (15%) granodiorite; NE corner of cabin, main shaft.	Grab	<5	<0.2	3	24	188	6	<5	<10	295	<100	3	<10			
* 239	Fresh wt medium-grained biotite granodiorite (to quartz monzonite); main shaft.	Grab	<5	<0.2	2	13	46	<5	<5	<10	270	<100	2	10			
240	Milky quartz exposed in 40-ft-long cut face across main Greenback vein (30 ft wide); local submetallic gray hairline veinlets (<3%); Fe stns; open and filled vugs (<1%).	Chip 30 ft	25	88	6	3185	45	122	<5	<10	50	<100	1	25	<20	<10	<5
241	Epidotized wt coarse-grained quartz monzonite with pk feldspar phenocrysts.	Do....	<5	0.7	4	25	58	60	<5	<10	280	<100	1	<10	<20	30	6
242	Epidotized wt grn peg (65%) and fine- to medium-grained epidotized and silicified wt grn (35%); pk feldspar phenocrysts.	Random chip/grab (50% each)	350 (0.01 oz gold/ton)	<0.2	3	26	15	197	<5	<10	81	<100	3	<10	<20	25	9
* 243	Milky quartz vien strikes N 75°E, dip 18°N; heavy Fe stns and Jarosite stns on fractures; open and filled vugs.	Chip 7 ft	19	32	15	3020	260	120	<5	<10	72	<100	3	115	<20	<10	<5
* 244	Fine- to medium-grained silicified and epidotized quartz monzonite sampled for 2 ft above, and 2 ft below the vein (site 239) manganese and Fe stns; Fe stns after sulfides, very minor mafic silicates.	Chip 4 ft	<5	0.5	16	173	395	40	<5	<10	2450	<100	1	15			
245	Medium- to very coarse-grained wt quartz monzonite with pk feldspar phenocrysts; locally epidotized, especially in medium-grained fraction.	Chip 70 ft	40	<0.2	3	15	36	<5	<5	<10	262	<100	3	<10	<20	38	9
* 246	Rhyodacite dike, locally (50%) epidotized.	Chip 30 ft	12	<0.2	3	34	45	<5	<5	<10	455	<100	3	<10			
247	Epidotized, kaolinized, and silicified quartz monzonite; heavy Fe stns after sulfides, very minor mafic silicates.	Grab	98	0.2	5	22	23	295	<5	<10	20	<100	2	<10			
* 248	Silicified, lightly epidotized, and heavily Fe stained quartz monzonite.	Chip 50 ft	33	<0.2	3	17	23	90	<5	<10	57	<100	3	<10			
FIGURE 20. -- Olympic prospect:																	
249	Massive Fe stained milky quartz; fine-grain-sized cavities after pyrite.	Random chip	5	35	5	380	30	60	<5	<10	42	<100	18	75			
250	Massive Fe stained milky quartz; no visible sulfides; 2 ft gap in chip trace.	Chip 14 ft	5	19	3	276	10	43	<5	<10	28	<100	5	60			

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

FIGURE 20. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Rock samples -- continued:																	
251	Massive Fe stained milky quartz; minor minor cinnabar stns; no other sulfides.	Chip 4 ft	35	19	5	895	48	110	<5	<10	43	<100	2	150			
252	Fe stained vein quartz from adit dump; visible dark gray sulfides (<5%); jarosite (<5%), Fe oxide pseudomorphs of pyrite.	Select grab	<5	3.1	29	1715	1685	5	<5	<10	662	270	6	95			
253	Blue- to gray-green Fe stained andesite; manganiferous dendrites; plagioclase phenocrysts.	Grab	22	58	4	1610	26	62	<5	<10	20	<100	15	80	<20	32	<5
254	Massive milky quartz; Fe and cinnabar stns; patches of drusy quartz; no sulfides seen.	Chip 8 ft	105	34	4	745	15	67	<5	<10	40	<100	3	100			
255	Do.....	Chip 8 ft	53	55	8	3590	29	65	<5	<10	36	<100	9	115			
256	Massive milky quartz; heavy Fe stns, cinnabar stns along fractures; grain-sized vugs after sulfides.	Chip 7 ft	27	8.6	3	221	8	18	<5	<10	39	<100	2	180	1360	3625	560
Plate 1. -- Mineralized areas and miscellaneous prospects, geothermal prospect, and placer prospects:																	
10.) Black prospect:																	
257	Heavily Fe stained milky quartz vein; from bottom - 0 - 1.3 ft quartz, 1.3 - 1.6 ft gap, 1.6 - 3.3 ft quartz, 3.3 - 3.6 gap, 3.6 - 5.6 quartz; strike N.40°W., dip 31°SW.	Chip 5.3 ft	5	12	430	1320	735	42	<5	12	65	<100	5	60			
258	Wt hornblende biotite quartz granodiorite; subfoliated; weakly epidotized.	Chip 5 ft	<5	0.2	5	10	55	<5	<5	<10	188	<100	2	35			
11.) Shirley Ann prospect:																	
259	Vein-like milky quartz zone of peg dike; light Fe stns; peg appears to strike N.20°W., dip 33°NE., parallel to jointing.	Chip 1.5 ft	<5	<0.2	3	6	7	<5	<5	<10	28	<100	1	150	<20	15	<5
260	Coarse- to very coarse-grained muscovite (5%) biotite (5%) potassium feldspar (40%) quartz (40%) granite; weak epidote and Fe stns; foliation strike N 54°W, dip 74°NE.	Random chip	<5	0.2	4	26	96	<5	<5	<10	120	<100	4	30			
12.) Golden Fleece prospect [rock and stream sediment]:																	
* 261	Medium- to coarse-grained pk grn; Fe stns after biotite; no visible sulfides.	Grab	<5	<0.1	6	26	43	<5	<5	<10	148	<100	1	<10	30	73	21
262	Sd > pbl >> slt; pk grn.		<5	<0.1	5	7	48	<5	<5	<10	452	<100	1	10			

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted													
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
13.) unnamed prospect [rock samples]:																	
263	Coarse-grained to pegmatitic pk and wt grn; heavily Fe-stained blebs and fractures.	Select grab	<5	<0.1	7	11	12	8	<5	<10	56	<100	1	<10			
264	Carrot- to salmon-pk felsite dike; minor hornblende phenocrysts; Fe stns fractures.	Grab	<5	<0.1	4	15	25	8	<5	<10	170	<100	1	<10	28	75	17
14.) Upper Bear Creek prospect [rock samples]:																	
265	Epidotized and slightly silicified medium-grained sucrosic grn.	Grab	<5	<0.2	2	16	30	<5	<5	<10	232	<100	<1	20	<20	37	8
266	Silicified fine- to medium-grained grn; weak Fe stns; minor epidote.	Grab	10	4.5	2	705	55	<5	<5	<10	242	<100	2	125	635	1540	360
267	Quartz zone from pegmatitic facies in granodiorite.	Chip 0.8 ft	<5	<0.2	5	22	22	<5	<5	<10	255	<100	1	30	<20	35	10
15.) unnamed prospect [rock samples]:																	
268	Vein-like milky quartz zone of peg dike follows fault zone; 1% geothite after pyrite.	Chip 1 ft	<5	0.3	2	10	7	<5	<5	<10	85	<100	2	30			
269	Vein-like milky quartz zone of peg dike follows fault zone; 1% geothite after pyrite.	Chip 2 ft	25	<0.2	2	13	17	8	<5	<10	27	<100	<1	95	<20	48	<5
270	Grn peg; mainly potassium feldspar, < 10% quartz; heavy Fe stns.	Chip 1 ft	<5	0.3	8	10	9	<5	<5	<10	59	<100	2	20	<20	20	<5
16.) Bear Creek prospect [two stream sediment and 3 rock samples]:																	
271	Sd >> slt; subangular; 90% pk grn/peg; 10% maf.		<5	<0.1	7	15	118	<5	<5	<10	820	<100	<1	<10			
272	Sd > slt > pbl; subangular; 90% pk grn/peg; 10% maf.		5	<0.1	7	13	73	<5	<5	<10	565	<100	1	<10			
273	Epidotized pk peg and quartz; limonite boxwork and psuedomorphs after pyrite, and minor pyrite, occur along seams and as disseminated blebs.	Select	11750 (0.343 oz gold/ton)	2.6	5	115	35	20	12	<10	53	<100	2	85	<20	20	<5
274	Shear zone in pk grn; strongly kaolinzed, and weakly epidotized and silicified grn gouge; fine gray streaks and blebs.	Chip 0.5 ft	5	<0.1	2	13	25	5	<5	<10	382	<100	1	<10	42	108	9
275	Strongly epidotized coarse-grained pk grn; 1/8- to 1-in.-thick epidote veins occur across 10 ft of grn outcrop; local tectonic breccia with epidote cement.	Chip 1 ft	65	<0.1	2	9	45	5	<5	<10	435	<100	<1	10	28	65	5

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - (continued) Sample no.	Description	Sample type	In parts per million, except as noted														
			Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
17.) Can Pa prospect [1 pan concentrate, 3 rock samples]:																	
276	10% cbl, 30% pbl, 40% coarse sd, 20% sd & slt; pk grn > volcanics.	Recon pan/0.008	25	0.2	18	17	92	12	<5	<10	535	110	2	35	550	1375	160
277	Basaltic andesite dike strikes N 20°E, dips 66° NW through biotitie schist.	Chip 4.5 ft	53	0.2	48	<2	140	<5	<5	<10	725	760	1	155	65	165	15
278	Fe stained biotite schist with 1/4-in. felsite veins every 6 in. Foliation concordant with dike.	Chip 6 ft	12	0.1	30	<2	102	<5	<5	<10	530	235	4	190	22	55	15
279	An 8-ft-thick leucocratic zone strikes N 37°W and dips 33°NE through gneissic grn; zone is 80% aplite and 20% potassium feldspar quartz peg; minor Fe stns. Country rock is a medium- to coarse-grained subfoliated grn; mineralogically similar to peg, but with 5% fine-grained biotite and minor chlorite and sericite.	Chip 8 ft	<5	<0.1	3	<2	21	10	<5	<10	80	<100	<1	<10	<20	<10	<5
18g.) Sacajawea hot springs [sediment sample]:																	
280	From hot spring rivulets; pbl = sd; clasts have wt coating which does not effervesce under dilute hydrochloric acid.		<5	<0.1	4	24	58	<5	<5	<10	290	<100	1	40			

PART II. -- PLACER PROSPECT ALLUVIAL SAMPLES

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - (continued) Sample no.	Description [magnetic/nonmagnetic (grams)]	Interval/ volume ft/cub yd	Ounces/ cubic yd free Au (total mg)	Value/ cubic yd $400/oz	In parts per million (ppm), except as noted												
					Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
19p.) Cape Horn Creek placer:																		
281	Pbl > sd > slt = cbl, 1% black sd; 45% pk grn, 30% wt grn, 20% maf; [0.85/424.36]	Recon pan/0.016	0.004 (0.009)	$1.61	<0.1	5	6	46	<5	<5	<10	110	<100	<1	<10	470	1120	50
Trench 1: *																		
282	Step 1: 0-0.5 ft topsoil, -2.3 ft is 75% sd & pbl, 25% cbl; minor cly. Step 2: 2.4-4.7 ft similar, in hard cly. 90% grn, 10% maf. [9.31/143.14]	0-4.7/ 0.17	.00002 (0.109)	.01	0.7	6	20	36	5	<5	<10	283	<100	<1	35	410	985	82

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - (continued) Sample no.	Description [magnetic/nonmagnetic (grams)]	Interval/ volume ft/cub yd	Ounces/ cubic yd free Au (total mg)	Value/ cubic yd $400/oz	In parts per million (ppm), except as noted												
					Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
283	4.7-6.1 ft 80% sd & pea gravel and 20% cbl in hard cly; cbl are 95% coarse-grained grn, 5% maf. Next 2 ft brown cly with gray lenses; lowest 0.6 ft sandy cly. [9.67/163.00]	4.7-8.7/ 0.148	.00004 (0.204)	.02	0.3	9	13	32	7	<5	<10	225	<100	<1	15	295	650	48
Trench 2: *																		
284	0-0.5 ft topsoil, -3.2 ft is 50% cbl, 40% sd & pea gravel and 10% small boulders; mainly grn, minor peg > quartz > schist; moderate cly matrix is high for region. [3.35/161.40]	0-3.2/ 0.119	.00002 (0.059)	.01	0.1	9	12	41	10	<5	<10	240	<100	<1	15	460	1025	62
285	0-0.5 ft topsoil, -3.2 ft is 50% cbl, 40% sd & pea gravel and 10% small boulders; mainly grn, minor peg > quartz > schist; minor cly. [11.58/173.32]	3.2-8.4/ 0.193	None	None	0.1	13	23	60	7	<5	<10	342	<100	<1	10	865	1820	148
286	95% coarse sd, 5% boulders; 85% grn, 15% maf, 1% schist & quartz. [10.60/193.76]	8.4-14.1/ 0.211	Do...	Do...	0.2	10	29	45	5	<5	<10	258	<100	<1	10	610	1405	90
Trench 3: *																		
287	0-1 ft 70% slt matrix and 30% cbl; 1-5 ft 50-55% cbl, 40-45% coarse angular sd; a 0.5-ft sd and pea gravel lense at 3 ft; mainly grn, minor peg & 10% maf. [0.45/119.48]	0-5/ 0.185	Do...	Do...	0.1	8	21	48	<5	<5	<10	425	<100	<1	20	2520	5850	375
Trench 4: *																		
288	0-0.3 ft topsoil, 0.3-2.4 ft 85% coarse angular sd, 15% subrounded cbl, no cly, loose, unstratified. [2.20/162.00]	0-2.4/ 0.089	.00001 (0.036)	<.01	0.2	5	20	64	<5	<5	10	645	<100	1	<10	5540	1.30%	580
Trench 5: *																		
289	0-1.7 ft 80% coarse angular sd, 20% pbl, -3.7 ft 65% sd & 35% pbl; 80% grn & peg, 20% maf. [2.74/164.10]	0-3.7/ 0.137	None	None	0.1	16	15	34	18	<5	10	370	<100	<1	20	1750	4015	265
290	90% fine to coarse sd with a 0.1-0.3-ft-thick cbl bed in middle; several 0.1- to 0.4-ft-thick cly lenses. [1.43/128.40]	3.7-5.5/ 0.067	Do...	Do...	0.1	10	11	34	8	<5	12	412	<100	<1	75	1860	4150	250
	*																	

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - (continued) Sample no.	Description [magnetic/nonmagnetic (grams)]	Interval/ volume ft/cub yd	Ounces/ cubic yd free Au (total mg)	Value/ cubic yd $400/oz	In parts per million (ppm), except as noted												
					Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Banner Creek [0.5 mi above confluence with Cape Horn Creek]:																		
291	10% cbl, 10% pbl > pea size, 50% pbl < pea size, 30% sd; 80 grn (wt > pk), 5-10% quartz, 5-10% metamorph., 5% maf; heavy Fe stns. [8.84/278.90]	Recon pan/0.016	.00020 (0.049)	.08	0.1	9	22	117	<5	<5	<10	302	<100	<1	25	3700	7650	275
Rivulet [1.5 mi southeast of Cape Horn]:																		
292	Sd > pbl >> slt; 60% pk grn, 30% rhy, 10% maf. [0.32/87.86]	Do...	None	None	<0.1	6	18	35	<5	<5	<10	218	<100	1	NA	50	125	40
20p.) Thatcher Creek placer:																		
293	Pbl >> cbl > sd = slt; wt grn > pk grn > rhy; Fe stns. [0.33/229.88]	Do...	Do...	Do...	<0.1	3	13	21	<5	<5	<10	92	<100	<1	<10	815	1920	125
Trench: *																		
294	0-0.3 cleared off, -0.11 topsoil & 5% pea gravel, -2.7 pea gravel & sd/minor cly matrix, -2.9 similar with more cly; 50% grn, 40% rhy & 10% metasediments & quartz. [0.02/283.84]	0-3.2/ 0.107	Do...	Do...	<0.1	3	9	18	<5	<5	<10	602	<100	<1	30	170	415	26
295 *	20% pbl, 40% coarse sd, 40% fine sd-cly; pk grn > rhy > maf; water milky tan like glacial flour. [0.36/208.46]	Recon sluice/ 0.1	Do...	Do...	<0.1	6	25	44	7	<5	<10	120	<100	<1	NA	1350	3180	125
296	30% pbl, 40% coarse sd, 20% fine sd & slt, 10% org; 75% Fe stained rhy, 25% pk grn.	Stream sediment	[Geochemical Au <5 ppb]		<0.1	6	18	50	<5	<5	<10	585	<100	1	<10	32	80	32
297	10% pbl, 60% coarse sd, 30% sd & slt; 60% Fe stained rhy, 40% pk grn.	Do...	Do...		<0.1	5	14	57	<5	<5	<10	286	<100	2	10			
298	10% pbl, 60% coarse sd, 25% sd & slt, 5% org; 60% Fe stained rhy, 40% pk grn.	Do...	Do...		<0.1	22	31	176	8	<5	<10	960	<100	4	<10			

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - (continued) Sample no.	Description [magnetic/nonmagnetic (grams)]	Interval/ volume ft/cub yd	Ounces/ cubic yd free Au (total mg)	Value/ cubic yd $400/oz	In parts per million (ppm), except as noted												
					Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
21p.) Swamp Creek placer:																		
299	10% pbl, 60% coarse sd, 25% sd & slt, 5% org; pk grn > wt grn, 15% maf; Fe stns. [1.04/415.00]	Recon pan/0.016	.00002 (0.003)	.01	<0.1	3	12	34	<5	<5	<10	135	<100	<1	<10	450	1125	72
Trench 1: *																		
300	Sd > cbl > pbl; 65% pk grn, 25% peg, 10% rhy & maf. [84.29/275.38] *	0-2/ 0.275	Do... (0.200)	Do...	<0.1	7	57	71	<5	<5	25	1025	<100	3	20	8350	2.00%	2710
301	80% < pea size: sd >> pbl > slt; 80% pk grn, 10% peg, 10% maf. 20% > pea size: 60% pk grn, 30% maf, 10% peg. From center stream. [11.03/154.90]	Recon sluice/ 0.275	None	None	<0.1	5	28	55	<5	<5	10	485	<100	2	10	3625	7850	915
302	20% cbl, 20% pbl, 50% sd, 10% slt; 70% pk grn, 20% dacite, 10% maf. [18.64/153.02]	Recon sluice/ 0.1	.00003 (0.093)	.01	<0.1	6	20	56	<5	<5	<10	348	<100	<1	<10	1700	3530	1380
22p.) Flat Creek placer:																		
303	50% pbl > pea size, 30% pbl < pea size, 20% sd & slt; 50% wt grn, 30% pk gr, 15% rhy/maf, 5% quartz. [0.06/328.32]	Recon pan/0.016	.00002 (0.006)	.01	<0.1	3	4	19	<5	<5	<10	108	<100	<1	<10	500	1210	48
23p.) Bench Creek placer:																		
304	10% cbl, 10% pbl > pea size, 50% pbl < pea size, 30% sd; 80 grn (wt > pk), 5-10% quartz, 5-10% metamorph., 5% maf; heavy Fe stns. [0.51/245.00]	Do...	.00004 (0.093)	.02	<0.1	5	9	76	<5	<5	<10	127	<100	<1	20	425	1050	63
305	65% grn (wt >> pk = peg), 25% maf, 10% rhy. [3.02/352.94]	Recon sluice/ 0.273	.00001 (0.095)	<.01	0.3	3	18	54	5	<5	42	275	<100	<1	10	2125	4950	335
24p.) No Sweat placer:																		
306	40% cbl, 30% pbl (> pea size), and 30% pbl (< pea size), sd and slt; 60% pk grn, 30% wt grn and 10% maf. [0.73/144.54]	Recon pan/0.016	None	None	<0.1	10	7	83	<5	<5	<10	216	<100	<1	NA	112	310	18

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - (continued) Sample no.	Description [magnetic/nonmagnetic (grams)]	Interval/ volume ft/cub yd	Ounces/ cubic yd free Au (total mg)	Value/ cubic yd $400/oz	In parts per million (ppm), except as noted													
					Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
24p.) No Sweat placer - continued:																		
307	10% cbl, 20% pbl (> pea size), 40% pbl (< pea size), 30% sd and slt; 70% pk grn, 20% wt grn, 5% maf, 5% quartz. [0.38/221.56]	Recon pan/0.016	None	None	<0.1	8	15	118	<5	<5	<10	257	<100	1	15	125	305	25
25p.) Trap Creek placer:																		
308	Pbl >> sd > cbl; 90% grn, 10% maf. [1.42/99.22]	Recon sluice/ 0.1	Do...	Do...	<0.1	4	8	38	<5	<5	<10	243	<100	1	NA	1120	2415	187
309	50% cbl, 20% pbl, 30% sd, slt and cly; mainly grn with as much as 5% vein quartz. [0.35/253.80]	Recon pan/0.016	.00003 (0.007)	.01	0.2	3	5	26	5	<5	<10	160	<100	<1	25	615	1510	132
26p.) Meadow Creek placer:																		
310	50% cbl, 20% pbl (> pea size), 15% pbl (> pea size), 10% sd & < 5% slt; 80% pk grn and 20% maf. [0.58/178.88]	Recon sluice/ 0.1	.00007 (0.222)	.03	<0.1	2	10	15	<5	<5	10	297	<100	1	15	1420	2970	243
311	300 ft upstream from confluence with Trap Creek; 38% pbl (22% > pea size), 45% sd, 10% slt, 2% cly and 1-2% black sd; 60% pk and 40% wt grn. [0.08/340.24]	Recon pan/0.016	None	None	<0.1	2	3	12	<5	<5	<10	97	<100	<1	<10	590	835	65
Trench 1: *																		
312	300 ft below confluence with Trap Creek; pbl + cbl << cly + slt + sd; mainly coarse-grained grn and peg, 2% maf. [3.66/276.18]	0-2/ 0.275	<.00001 (0.033)	<.01	<0.1	2	12	18	<5	<5	12	172	<100	<1	<10	2400	5850	415
Trench 2: *																		
313	Taken in active stream bed, from inside of a right angle turn (to maximize heavy mineral concentration); 10% boulders, 40% cbl, and 50% sd & pea gravel; 80% pk & wt grn & peg, 15% maf, 5% rhy and minor quartz. [6.43/179.44]	Do...	.00005 (0.420)	.02	2.5	3	220	23	<5	<5	25	435	<100	<1	40	3310	7900	580
*																		

TABLE A-1. -- Trace-element analyses from the Hanson Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - (continued) Sample no.	Description [magnetic/nonmagnetic (grams)]	Interval/ volume ft/cub yd	Ounces/ cubic yd free Au (total mg)	Value/ cubic yd $400/oz	In parts per million (ppm), except as noted Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
27p.) Elk Creek placer:																		
Trench 1: *																		
314	70% grn & quartz sericite schist, 30% maf, red garnet & zircon in black sd. [13.86/339.30] *	0-2.8/ 0.275	.00012 (1.832)	.05	2.8	14	60	44	30	<5	170	428	<100	2	125	2800	6875	825
315	Few cbl, 40% pbl (> pea size), 20% pea gravel, 40% sd & slt; pk grn. [4.80/267.62]	Recon pan/0.016	None	None	<0.1	5	5	32	<5	<5	<10	180	<100	<1	<10	245	575	90
Trench 2: *																		
316	Polymodal (bld > cbl = sd = slt); 75% grn, 25% maf. [1.02/189.00] *	0-2.8/ 0.275	.00004 (0.113)	.02	0.2	2	13	16	5	<5	15	430	<100	<1	10	720	1710	308
317	Pbl (mainly < pea size) > sd; 80% pk grn, 10% maf, 10% metasediment. [1.90/239.82]	Recon sluice/ 0.1	None	None	0.1	3	9	45	<5	<5	<10	285	<100	2	20	720	1750	215
28p.) North Fork Canyon Creek (Lost Cabin) placer:																		
318	10% cbl, 50% pbl, 40% sd & slt; 80% pk grn, 20% dacite/rhyodacite porphyry, minor garnet, monazite, and zircon. [2.74/216.72]	Do...	Do...	Do...	<0.1	3	9	48	<5	<5	<10	223	<100	<1	20	172	375	26
319	15% cbl, 25% pbl, 50% sd, 10% slt; 70% pk grn, 20% peg, 10% dacite/ rhyodacite porphyry, monazite, garnet, zircon. [14.62/156.82]	Do...	Do...	Do...	<0.1	6	12	44	<5	<5	<10	330	<100	1	85	950	2280	97
320	10% cbl, 30% pbl, 40% coarse sd, 20% sd & slt; pk grn, minor volcanics. [49.61/164.96]	Do...	Do...	Do...	0.2	6	9	70	<5	<5	40	502	<100	5	150	1360	2930	215
29p.) Stanley Lake Creek placer:																		
Trench 1: *																		
321	200 ft below bridge, SW1/4, NW1/4, Sec 25; 0-1 ft sandy soil, -2.2 ft sd, -3 ft cly with 15% sd & 10% cbl, -4 ft cly, -6 ft increasing sd with decreasing cly; clasts 80% grn, 15% maf, 5% schist; trace garnet & zircon sd. [34.85/211.06]	0-6/ 0.222	<.00001 (0.079)	<.01	0.1	14	24	36	23	<5	15	210	<100	1	10	2600	6420	525
Trench 2: *																		
322	20% boulders & cbl, 5% pbl (> pea size), 60% pea gravel & sd, 5% slt & cly; 60% grn, 15% maf, 10% phyllite/schist, 10% metasediments (with quartz veins); garnet to 0.25 in. diameter. [1.8/200.36] *	0-2.8/ 0.275	<.00001 (0.113)	<.01	<0.1	4	7	11	<5	<5	27	440	<100	<1	<10	2250	5200	685

TABLE A-1. -- Trace element analyses from the Hanson's Lakes study area, Boise and Custer County, Idaho -- continued.

PLATE 1. - continued Sample no.	Description Heavy minerals recovered: [magnetic/nonmagnetic (grams)]	Interval/ volume ft/cub yd	Ounces/ cubic yd free Au (total mg)	Value/ cubic yd $400/oz	In parts per million (ppm), except as noted													
					Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y
Trench 3: *																		
323	Below concrete dam; sampled below boulder/cbl stream pavement; sd >> cbl > bouldrs; 50% grn, 25% maf, 15% schist. [14.64/152.14] *	0-2.8/ 0.275	<.00005 (0.401)	.02	1.9	38	15	34	5	<5	15	595	<100	2	15	2910	7250	690
324	20% pbl > pea size, 30% pbl < pea size, 20% sd & slt, 30% cly; 85% grn, 5% vein quartz, 3% black sd. [1.05/251.88]	Recon pan/0.016	None	None	<0.1	3	10	69	<5	<5	<10	278	<100	<1	NA	850	2060	140
325	40% cbl, 50% pbl (< pea size) & sd, 5% slt; clasts 45% pk grn, 30% wt grn, 20% maf. [63.76/ 270.46]	Recon sluice/ 0.1	Do...	Do...	0.1	6	23	86	<5	<5	<10	418	<100	2	30	2105	4460	240
30p.) Payette placer:																		
Adjacent to, but outside the study area; see Jones, James J. (1986), and Killsgaard and others (1970, p. D82-91).																		
Grouse Creek epithermal gold mine (fig. 1):																		
326	50% reddish brown cly gouge; 50% 50% silicified & kaolinized rhy.	Recon pan/grab	None	None	1.2	8	10	8	275	<5	<10	20	<100	3	NA	32	80	12
Porter placer mine (fig. 1):																		
327	Charcoal gray heavy mineral concentrates from stockpile.	Grab	Do...	Do...	0.3	3	13	58	6	<5	45	840	<100	6	NA	2250	5540	975

Table A-2.--Major-element oxide analyses of rock samples from the Hanson Lakes study area, Boise and Custer Counties, ID

[Analyses by plasma emission spectroscopy, except LOI (loss on ignition) by gravimetric analysis; ft - foot, in. - inch, pk - pink, wt - white, grn - granite, rhy - rhyolite, Fe stns - iron stains]

FIGURE NO. Map no.	Description	Sample type	In percent											
			Al2O3	CaO	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SiO2	TiO2	BaO	LOI	Totals
FIGURE 5	IDA prospect area:														
13	Coarse-grained, pk biotite grn, 50-70% orthoclase; weakly silicified, weak Fe-stns, no visible sulfides.	Random Chip	2.25	<0.01	1.42	1.18	0.02	0.020	0.46	0.03	91.80	0.16	NA	0.62	97.96
14	Pinkish-buff rhy, moderately silicified and Fe-stained.	Do...	9.65	0.09	1.45	3.72	0.06	0.006	2.65	0.01	79.30	0.10	NA	1.37	98.41
18	Chlorite, epidote and lesser garnet tactite and lesser hornfels.	Chip 1.5 ft	14.32	2.05	1.05	5.45	0.07	0.027	3.35	0.22	72.03	0.15	NA	1.02	99.74
24	Medium- to coarse-grained, wt grn.	Random Chip	13.85	1.63	1.28	4.20	0.29	0.025	4.35	0.05	73.12	0.29	NA	0.67	99.76
FIGURE 6	Pass Over prospect:														
91	Light buff-colored rhy; Fe stns on surfaces and along fractures; trace of fine-grained sulfides with limonite after pyrite.	Do...	12.05	0.05	1.05	3.60	0.08	0.019	3.14	<0.01	78.85	0.05	<0.01	1.09	99.98
92	Dark grayish green quartz dacite porphyry; relatively few mafics.	Do...	15.08	3.02	6.50	3.60	2.56	0.100	3.52	0.45	59.75	1.30	0.19	3.20	99.27
93	Medium- to coarse-grained pk-to-brown grn; variously epidotized, silicified, chloritized, and kaolinized (minor). In two segments on either side of dike (site 87).	Chip 200 ft	13.33	0.04	2.45	4.37	0.18	0.038	2.64	<0.01	73.42	0.27	0.08	1.42	98.24
94	Medium- to coarse-grained pk grn; silicified and highly epidotized and chloritized.	Grab over 200 ft	12.67	0.01	3.01	4.10	0.23	0.054	2.20	0.08	73.60	0.43	0.10	1.89	98.37
97	Buff-colored rhy; kaolinized.	Random chip	12.33	0.37	1.62	5.12	0.26	0.022	2.61	<0.01	74.05	0.09	0.05	1.60	98.12
98	Quartz biotite schist -- formed in Fault Zone -- strike N.37°W., dip 90°.	Chip 1 ft	14.35	1.28	5.72	6.52	2.42	0.070	4.23	0.25	61.08	1.02	0.09	2.18	99.21
99	Pegmatitic wt grn; few mafics, subgraphic; Joints and foliation strike N.74°E., dip 84°NW.	Random chip	14.32	0.34	0.65	2.83	0.20	0.009	5.12	0.02	73.80	0.08	0.03	0.78	98.18
101	Fine- to medium-grained wt grn; Fe- and manganese-stained and epitodized; crops-out for 40 ft south of mafic dike.	Do...	13.60	0.97	1.12	5.76	0.50	0.023	2.53	0.07	72.58	0.11	0.31	1.53	99.10
102	Dark-grayish-green medium-grained mafic dike; epidote, hornblende, magnetite, and and wt plagioclase.	Do...	14.86	1.61	5.38	4.25	2.08	0.065	3.25	0.22	62.35	0.46	0.14	3.10	97.77
104	Pale green latite; highly silicified and very hard, resembles quartzite.	Chip 300 ft	7.05	0.26	1.60	2.35	0.30	0.011	0.16	0.02	87.03	0.15	0.02	1.30	100.25
111	Greenish buff rhy; limonite stns on joints, goethite blebs after sulfides 1 mm across.	Chip 700 ft	12.48	0.10	1.42	5.02	0.05	0.009	2.98	0.01	76.23	0.08	NA	0.98	99.36
112	Medium- to coarse-grained pk grn; epidotized, chlorite after biotite; limonite-stained, minor jarosite.	Chip 100 ft	14.56	0.38	2.68	3.32	0.18	0.036	4.60	0.05	70.35	0.32	0.14	1.75	98.37
113	Buff-colored rhy; limonite stns along fracture surfaces, moderately epidotized and slightly silicified.	Chip 670 ft	11.53	<0.1	1.26	5.19	0.01	0.006	2.25	<0.01	77.82	0.06	0.02	1.02	99.17

Table A-2.--Major-element oxide analyses of rock samples from the Hanson Lakes study area, Boise and Custer Counties, ID - continued

Map no.	Description	Sample type	In percent											
			Al2O3	CaO	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SiO2	TiO2	BaO	LOI	Totals
114	Grayish wt rhy, weathers to pinkish wt; porcelaneous, greenish mica.	Random chip	11.90	0.12	0.93	6.45	0.01	0.005	2.40	<0.01	77.10	0.04	0.01	0.69	99.66
117	Fine-grained biotite gneiss (3.5 ft) and quartzite/biotite quartz gneiss (4.5 ft); 1/8- to 1-in.-wide wt grn stringers parallel foliation (1-ft stringer not sampled).	Chip 9 ft	4.50	12.65	1.29	1.18	2.17	0.042	0.62	0.09	73.72	0.25	NA	2.92	99.43
120	Coarse-grained flesh pk grn; Fe stns along fractures; 5% chlorite, minor biotite, in contact with metacarbonate (site 116).	Chip 2 ft	14.43	0.88	0.63	5.84	0.06	0.009	3.60	0.02	73.20	0.10	NA	1.05	99.82
121	Carbonate metasediment containing siderite, calcite and quartz.	Chip 3 ft	3.62	23.60	2.82	0.60	0.43	0.093	0.02	0.06	51.45	0.30	NA	17.15	100.14
122	Coarse-grained pinkish wt biotite quartz monzonite; surface 25% limonite-stained.	Chip 8 ft	15.03	3.80	2.13	3.65	0.85	0.31	3.78	0.16	68.90	0.30	NA	1.02	99.93
123	80% gneissic quartzite and 20% quartz phyllite; epidote and Fe stns on fractures.	Chip 5 ft	6.30	16.75	2.42	0.72	3.08	0.071	1.02	0.13	67.60	0.37	NA	2.45	100.91
125	Medium-grained fresh biotite hornblende granodiorite; mafic rich, minor epidote and Fe stns.	Grab	17.05	4.02	6.58	2.17	3.15	0.11	3.85	0.45	58.60	1.50	NA	2.62	100.10
135	Fine- to medium-grained biotite granite dike; heavy Fe stns.	Random Chip	16.34	7.86	5.48	4.05	3.42	0.078	3.69	0.30	55.17	1.07	0.17	1.88	99.51
137	Garnet epidote quartz skarn; malachite stns in quartzitic zones.	Chip 8 ft	4.20	7.22	4.97	0.07	1.65	0.410	0.06	*	73.92	0.17	<0.01	4.25	96.92
138	highly silicified grn; heavy Fe stns, 5-10% malachite stns; across faults in pit.	Chip 2 ft	1.96	16.80	4.02	0.18	0.18	0.140	0.04	0.52	64.05	0.10	<0.01	12.30	100.29
140	Highly silicified biotite grn; heavy Fe and manganese staining; 3-5% of surfaces malachite stained, 5% siderite.	Random chip	2.21	2.93	3.80	0.16	0.81	0.29	0.06	0.50	83.57	0.19	NA	4.80	99.32
142	Coarse-grained foliate wt quartz monzonite; minor hornblende; epidotized.	Random chip	16.12	2.82	2.43	2.55	0.68	0.35	5.20	0.07	71.50	0.49	NA	1.05	103.26
FIGURE 9 caved adit area, Passover prospect:															
148	Chip trace dips 25° north to south: first 2.8 ft is porcelaneous greenish wt calc-silicate meta-carbonate; second 2.2 ft is a banded epidote-garnet tactite with a 0.3-ft-thick metallic gray sulfide band.	Chip 5 ft	15.62	0.86	1.57	3.82	0.21	0.018	3.85	0.05	71.60	0.22	0.17	0.88	98.87
FIGURE 16 Elk Mountain mineralized area; Gold Coin prospect:															
193	From top of mountain; medium- to course-grained propylitized and silicified granodiorite; 30-50% Fe stns.		12.61	0.43	1.91	2.72	0.46	0.05	4.06	0.05	75.1	0.16	NA	0.95	98.5

Table A-2.--Major-element oxide analyses of rock samples from the Hanson Lakes study area, Boise and Custer Counties, ID - continued

Map no.	Description	Sample type	In percent											
			Al_2O_3	CaO	Fe_2O_3	K_2O	MgO	MnO	Na_2O	P_2O_5	SiO_2	TiO_2	BaO	LOI	Totals
FIGURE 18	Stanley Ace prospect:														
216	Medium-grained to pegmatitic biotite quartz monzonite, Fe-stained surfaces.		16.32	1.78	3.01	3.86	1.06	0.036	3.86	0.21	68.41	0.36	NA	0.97	99.88
222	Cream colored muscovite grn, injected into foliated grn; feldspar phenocrysts, weak Fe stns, and minor Fe oxide pseudomorphs after pyrite.		15.57	1.03	0.66	8.50	0.25	0.008	2.63	0.16	69.25	0.06	NA	0.65	98.77
FIGURE 19	Greenback mine and Observation peak prospects:														
229	Medium- to very coarse-grained biotite (10%) quartz monzonite; locally pegmatitic.	Random chip	13.42	0.58	0.98	4.27	0.08	0.022	3.86	0.01	74.12	0.06	0.85	0.85	99.10
230	Epidotized quartz monzonite (60%); 1/4- to 1/2-in.-thick quartz veins (40%); Fe stns.	Select grab	7.45	2.21	1.05	3.68	0.08	0.006	1.50	0.02	79.25	0.07	1.15	1.15	97.62
232	Silicified quartz monzonite; quartz veinlets, Fe stns; from main shaft stockpile.	Grab	12.83	0.71	1.02	3.92	0.12	0.036	4.56	0.01	75.23	0.07	0.03	0.35	98.89
234	Silicified, epidotized biotite (15%) quartz monzonite; NE corner of cabin, main shaft.	Do....	14.65	0.56	1.52	3.63	0.14	0.035	3.64	0.02	70.57	0.16	3.25	3.25	101.43
235	Fresh wt medium-grained biotite granodiorite; main shaft.	Grab	15.18	1.52	0.30	3.25	1.49	0.046	4.55	0.01	72.10	0.21	0.66	0.66	99.78
239	Milky quartz vien strikes N 75°E, dip 18°NW; heavy Fe stns and jarosite stns on fractures; open and filled vugs.	Chip 7 ft	0.42	1.86	2.23	0.23	0.06	0.012	0.08	<0.01	91.80	0.01	<0.01	1.32	98.02
240	Fine- to medium-grained silicified and epidotized quartz monzonite sampled for 2 ft above, and 2 ft below the vein (239); manganese and Fe stns; Fe stns after sulfides, very minor mafic silicates.	Chip 4 ft	13.58	0.26	0.75	4.12	0.08	0.110	3.75	<0.01	74.32	0.05	0.09	0.65	97.76
241	Medium- to very coarse-grained wt quartz monzonite with pk feldspar phenocrysts; locally epidotized, especially in medium-grained fraction.	Chip 70 ft	14.03	0.62	0.90	3.63	0.07	0.038	4.75	0.02	75.65	0.05	0.06	0.61	100.43
242	Rhyodacite dike, locally (50%) epidotized.	Chip 30 ft	15.92	0.72	2.50	3.75	0.37	0.068	3.03	0.11	71.43	0.24	2.01	2.01	102.16
244	Silicified, lightly epidotized, and heavily Fe stained quartz monzonite.	Chip 50 ft	13.05	0.23	0.74	6.60	0.05	0.011	4.95	<0.01	72.40	0.03	0.04	0.56	98.66
PLATE 1	Miscellaneous lode prospects (sites 10-17), geothermal prospect (site 18g) and placer prospects (sites 19p-26p):														
257	Medium- to coarse-grained pk grn; Fe stns after biotite; no visible sulfides.	Grab	11.70	0.65	0.81	3.56	0.06	0.033	4.58	0.03	77.65	0.05	NA	0.40	99.52
275	Strongly epidotized coarse-grained pk grn; 1/8- to 1-in.-thick epidote veins occur across 10 ft of grn outcrop; local tectonic breccia with epidote cement.	Chip 10 ft	11.03	0.17	0.89	4.28	0.32	0.013	2.32	0.07	78.72	0.12	NA	0.86	98.79

TABLE A-3. -- Trace-element analyses by rock type

[< - less than; 1/2 of detection limit used to average undetected elements; * whole rock table A-2]

Sample no.	Summary description	Mean concentration in parts per million (ppm), except as noted; [number of samples analyzed if less than total]															
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
FAULT/VEIN/SHEAR ZONE SAMPLES:																		
Copper Mountain mineralized area:																		
Gouge/vein/mylonite fault zones (mainly unmineralized):																		
16	Quartz and gouge	<5	0.3	10	13	68	6	<5	<10	100	<100	1	20	45	113	34		
34	Epidotized granite	<5	0.1	3	14	56	2.5	<5	<10	245	<100	1	20					
70	Silicified rhyolite and gouge	<5	0.1	8	30	36	6	<5	<10	80	<100	2	10	45	105	32		
81	Quartz and minor rhyolite	<5	0.1	11	17	262	2.5	<5	<10	685	100	1	5					
162	Gouge and granite.	<5	0.5	38	33	320	10	<5	<10	698	<100	<1	35	50	132	25		
163	do...	<5	0.3	21	20	232	8	5	<10	645	105	<1	75	38	100	31		
188	do...	5	0.1	14	12	168	33	<5	<10	223	<100	1	30					
189	do...	5	1.0	114	16	990	35	<5	22	365	<100	1	50	52	133	8	<1	<1
Mean concentration:		<5	0.3	23.4	19	267	12.9	<5	<10	380	<100	1	31	46	117	28	<1	<1
Foliate shear zones (mainly mineralized):																		
99	Quartz schist in fault zone	<5	0.1	6	22	162	<5	<5	<10	425	195	5	15	50	123	16		
* 139	Silicified carbonate	1235	195	2635	2300	2155	17	15	37	865	<100	17	3150	10	17	11		
140	Silicified mylonitic granite	5	7.8	82	150	1350	<5	<5	27	1060	<100	8	210					
* 141	Silicified biotite granite	8	70	2970	2.3%	1.5%	5	<5	370	1980	<100	7	95	10	15	8	<1	1
144	Epidotized granite mylonite	<5	8.7	199	5320	5575	5	<5	120	605	<100	5	25	28	65	10		
178	Silicified subfoliate pink granite	17	33	2540	430	9050	<5	<5	190	2450	<100	5	80					
179	Sheared silicified gneiss/quartzite	<5	0.7	202	23	1385	<5	<5	16	725	<100	2	20					
180	Sheared tactite	<5	0.2	34	33	143	<5	<5	<10	218	<100	3	15					
182	do...	10	112	7750	2880	2.8%	6	<5	1130	6750	<100	40	100					
183	do...	182	180	2.0%	84	3.7%	132	<5	1960	3450	<100	30	170					
184	Hard gray quartzite	5	0.4	64	20	387	28	<5	<10	395	<100	1	65					
Mean concentration:		132	55.3	1498	1024	1837	18.7	<5	351	1720	<100	11	359	25	55	11	<1	1
Elk Mountain mineralized area:																		
205	White vein quartz; sulfides	10	41	6605	310	2800	30	<5	57	35	<100	40	70	<20	15	<5		
207	White vein quartz; Fe stains	5	0.3	30	10	43	6	<5	<10	50	<100	1	10	<20	22	<5		
210	Geothite boxwork, quartz veinlets	3240	157	85	2820	705	120	<5	18	45	<100	2	180	<20	23	28		
211	Vein quartz and silicified granite	335	27	225	118	252	102	<5	<10	56	<100	4	35	<20	25	10		
212	Quartz vein; Fe stains, muscovite	43	0.3	13	6	36	2195	5	<10	25	<100	1	10	180	435	43		
213	Select quartz; arsenopyrite, vugs	3860	2.3	39	14	22	10%	45	<10	20	<100	2	115	<20	5	<5		
214	Milky quartz vein; Fe stains	<5	0.7	31	79	22	22	<5	0.5	30	<100	1	10	<20	32	5		
215	White quartz vein; Fe stains	15	0.5	58	40	195	250	<5	<10	54	<100	3	10	<20	30	<5		
219	Massive milky quartz; minor vugs	<5	1.4	8	9	66	130	<5	0.5	36	<100	0.5	5	<20	25	<5		
220	White quartz vein; Fe stains	<5	0.05	4	4	5	120	<5	<10	40	<100	1	10	<20	5	<5		
221	do...	5	0.05	32	3	8	122	<5	<10	45	<100	3	10	<20	5	<5		
Mean concentration:		684	21	648	310	378	282	6.6	10	40	0	5.3	42	<20	56	9.4		
Observation Peak mineralized area:																		
Greenback mine (fig. 18):																		
230	Milky vein quartz	5	14	5	445	79	55	<5	<10	122	125	3	15	<20	38	5		
232	Massive milky quartz vein	37	35	8	1480	330	185	<5	12	27	<100	6	30					
235	Quartz vein; pit north of shaft	450	305	6	950	30	127	<5	<10	32	<100	2	135	<20	30	<5		
237	Fe-stained milky quartz	38	27	5	1030	37	183	<5	<10	32	<100	13	20					
240	Milky quartz; 40-ft-long cut face	25	88	6	3185	45	122	<5	<10	50	<100	1	25	<20	<10	<5		

TABLE A-3. -- Trace-element analyses by rock type -- Continued

[< - less than; 1/2 of detection limit used to average undetected elements; wt - white; * whole rock table A-2]

Sample no.	Summary description	Mean concentration in parts per million (ppm), except as noted; [number of samples analyzed if less than total]															
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
FAULT/VEIN/SHEAR ZONE SAMPLES -- Continued:																		
Observation Peak mineralized area -- continued:																		
Observation Peak (Fig. 18):																		
* 243	Milky quartz vien strikes N.75°E.	19	32	15	3020	260	120	<5	<10	72	<100	3	115	<20	<10	<5		
Olympic prospect (fig. 20):																		
249	Massive Fe-stained milky quartz	5	35	5	380	30	60	<5	<10	42	<100	18	75					
250	do...	5	19	3	276	10	43	<5	<10	28	<100	5	60					
251	do...	35	19	5	895	48	110	<5	<10	43	<100	2	150					
252	Fe-stained vein quartz; adit dump	<5	3.1	29	1715	1685	5	<5	<10	682	270	6	95					
254	Massive milky quartz; Fe stains	105	34	4	745	15	67	<5	<10	40	<100	3	100					
255	do...	53	55	8	3590	29	65	<5	<10	38	<100	9	115					
256	do...	27	8.6	3	221	8	18	<5	<10	39	<100	2	180	1360	3625	560		
Mean concentration:		62	52	7.8	1379	201	89	<5	<10	94	<100	5.6	86	105	284	43		
Miscellaneous prospects:																		
Black prospect:																		
257	Heavily Fe-stained milky quartz	5	12	430	1320	753	42	<5	12	65	<100	5	60					
Shirley Ann prospect:																		
259	Quartz zone; pegmatite dike	<5	<0.2	3	8	7	<5	<5	<10	188	<100	2	35					
Upper Bear Creek prospect:																		
267	Quartz zone; pegmatite dike	<5	<0.2	5	22	22	<5	<5	<10	255	<100	1	30	<20	35	10		
unnamed prospect:																		
288	Quartz zone; pegmatite dike	<5	<0.2	2	10	7	<5	<5	<10	85	<100	2	30					
289	do...	25	0.3	8	13	17	8	<5	<10	27	<100	<1	95	<20	46	<5		
Bear Creek prospect:																		
273	Select; epidote quartz pegmatite	11750	2.6	5	115	35	20	12	<10	53	<100	2	85	<20	20	<5		
274	Kaolinized shear zone in granite	5	<0.1	2	13	25	5	<5	<10	382	<100	1	<10	42	108	9		
MAFIC DIKE SAMPLES:																		
Copper Mountain mineralized area:																		
10	Quartz dacite dike strikes N.31°E.	<5	0.1	14	7	67	<5	<5	<10	520	<100	2	10	45	115	20		
46	Fine-grained blue-gray mafic dike	<5	0.1	221	2	79	<5	<5	<10	905	160	1	5					
93	Gray-green quartz dacite porphyry	8	0.3	24	20	127	18	<5	<10	592	<100	5	15					
* 103	Gray-green medium-grained dike	<5	0.8	101	27	635	<5	<5	10	448	100	2	10					
Observation Peak/Olympic prospect:																		
253	Gray-green Fe-stained andesite	22	58	4	1610	26	62	<5	<10	20	<100	15	80	<20	32	<5		
Miscellaneous/Can Pa prospect:																		
277	Andesite dike strikes N.20°.E	25	0.2	18	17	92	12	<5	<10	530	110	2	NA					
Mean concentration:		10.4	9.9	64	281	171	16.6	<5	<10	503	<100	4.5	20					

TABLE A-3. -- Trace-element analyses by rock type -- Continued

[< - less than; 1/2 of detection limit used to average undetected elements; wt - white; * whole rock table A-2]

Sample no.	Summary description	Mean concentration in parts per million (ppm), except as noted; [number of samples analyzed if less than total]															
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
TERTIARY PINK GRANITE:																		
Copper Mountain mineralized area:																		
5	Silicified; 1-2% pyrite	8	0.6	3	20	46	7	<5	5	218	<100	1	50	37	90	8		
8	Coarse-grained weakly silicified	<5	0.1	3	11	56	<5	<5	5	560	<100	1	70	50	128	<5		
11	Biotite coarse-grained, no sulfide	<5	0.1	16	8	24	<5	<5	5	92	<100	1	10					
* 13	do...	12	2.2	6	39	36	7	<5	5	132	<100	1	10	62	160	10		
22	Medium/coarse-grained epidotized	<5	<0.1	2	5	50	<5	<5	5	355	<100	1	5	115	276	21		
22	do...	<5	<0.1	2	5	50	<5	<5	<10	355	<100	1	<10	115	276	21		
28	Coarse-grained, silicified, vuggy	<5	0.2	15	29	66	<5	<5	5	68	<100	10	20	38	112	12		
29	Do.....	25	5.4	38	41	86	32	<5	5	145	<100	20	25	45	125	10		
35	Whitish silicified, seriate	<5	<0.1	12	11	11	10	<5	5	85	<100	<1	15	22	55	40		
38	Medium-grained, thin flow bands	<5	0.1	30	16	220	17	<5	5	157	<100	2	5	24	65	14		
49	Coarse/medium grained buff-pink	<5	<0.1	3	6	36	15	<5	5	163	<100	<1	5	30	75	58		
60	Weakly altered, heavy Fe stains	<5	1.1	80	280	290	10	<5	<10	465	<100	1	20					
62	Silicified granite; minor biotite	45	0.1	8	32	115	8	<5	<10	262	<100	1	25					
64	Altered, Fe-stains after pyrite	10	14	5	135	140	5	<5	5	142	<100	21	40	25	72	<5		
65	Medium-grained silicified, epidote	<5	0.1	9	48	112	5	<5	5	269	<100	2	5	66	170	6		
66	Coarse-grained, biotite, limonite	<5	<0.1	3	4	24	7	<5	5	162	<100	1	5	112	290	10		
73	Medium/coarse-grained, no mafics	<5	<0.1	3	2	14	<5	<5	5	58	<100	1	5	10	18	<5		
74	Flesh medium-grained Fe-stained	<5	<0.1	15	9	38	7	<5	5	223	<100	2	5					
76	do...	<5	<0.1	2	5	85	<5	<5	5	460	<100	1	10					
78	Medium/coarse-grained silicified	<5	<0.1	3	22	48	<5	<5	5	175	<100	1	10	43	112	8		
79	Medium/coarse grained propylitized	<5	0.1	8	24	137	<5	<5	5	475	100	8	10					
80	Coarse-grained; slickensides	<5	<0.1	12	6	32	6	<5	5	142	<100	2	5					
81	Coarse-grained; chloritic joints	<5	<0.1	5	9	82	<5	<5	5	560	<100	1	10	112	280	30		
84	do...	<5	0.1	3	15	16	<5	<5	5	50	<100	1	30					
85	Medium- to coarse-grained, banded	<5	0.4	33	60	117	<5	<5	5	263	<100	3	15					
94	Medium/coarse-grained brownish	<5	0.3	6	18	48	<5	<5	5	275	<100	2	20	40	102	25		
95	Medium/coarse-grained very altered	<5	0.1	11	28	67	<5	<5	5	420	<100	3	5	60	156	8		
96	Fresh medium-grained mafic rich	<5	0.2	30	35	196	<5	<5	5	695	180	3	10					
106	Highly silicified; cloudy feldspar	<5	0.2	5	12	49	<5	<5	5	405	<100	2	5	57	150	15		
107	Medium/coarse-grained; liesegang	<5	0.1	10	13	42	<5	<5	5	1805	<100	2	5	235	605	135		
108	Quartz-rich foliate pegmatite	<5	0.1	8	10	34	<5	<5	5	190	<100	4	5	30	82	<5		
109	Mafic medium-grained Fe-stained	<5	0.1	135	2	95	<5	<5	5	752	<100	7	5					
110	Altered medium-grained/pegmatitic	<5	0.1	31	9	64	<5	<5	5	170	<100	2	5					
* 113	Medium/coarse-grained epidotized	<5	0.3	51	15	375	<5	<5	5	268	<100	3	40	68	172	<5		
* 121	Coarse-grained flesh; Fe stains	<5	<0.1	3	6	15	20	<5	5	72	<100	2	5	25	75	6		
* 126	Medium-grained fresh hornblende	<5	0.2	30	35	196	<5	<5	5	695	180	3	10					
128	Medium-grained flow banded	<5	0.2	16	46	312	8	<5	5	602	135	1	10	27	68	30		
130	Fine/medium-grained leucocratic	<5	0.1	19	14	148	5	<5	5	443	100	<1	45	25	65	21		
* 136	Fine/medium-grained biotite; dike	<5	1.1	107	32	56	<5	<5	5	114	<100	2	[6875]					
171	Highly silicified foliated	<5	0.7	36	268	342	<5	<5	5	288	<100	1	10	60	152	11		
Miscellaneous prospects:																		
Shirley Ann prospect:																		
260	Coarse-grained potassium feldspar	<5	0.2	4	26	96	<5	<5	5	120	<100	4	30					
Golden Fleece prospect:																		
261	Medium to coarse-grained, biotite	<5	<0.1	6	26	43	<5	<5	5	148	<100	1	5	30	73	21		

TABLE A-3. -- Trace-element analyses by rock type -- Continued

[< - less than; 1/2 of detection limit used to average undetected elements; wt - white; * whole rock table A-2]

Sample no.	Summary description	Mean concentration in parts per million (ppm), except as noted; [number of samples analyzed if less than total]															
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
TERTIARY PINK GRANITE -- Continued:																		
Miscellaneous prospects -- continued:																		
unnamed prospect:																		
263	Coarse/pegmatitic, heavy Fe-stains	<5	<1	7	11	12	8	<5	5	56	<100	1	5					
264	Carrot/salmon-colored felsite dike	<5	<1	4	15	25	8	<5	5	170	<100	1	5	28	75	17		
Upper Bear Creek prospect:																		
265	Epdotized medium-grained sucrosic	<5	0.1	2	16	30	<5	<5	5	232	<100	<1	20	10	37	8		
266	Silicified fine/medium-grained	10	4.5	2	705	55	<5	<5	5	242	<100	2	125	635	1540	360		
Bear Creek prospect:																		
275	Strongly epidotized coarse-grained	65	0.1	2	9	45	5	<5	5	435	<100	0.1	10	26	65	5		
Mean concentration:		5.9	0.7	18	47	90	5.5	<5	4.7	311	56	2.8	17.2	73	185	30		
TERTIARY RHYOLITE:																		
Copper Mountain mineralized area:																		
6	Buff-colored rhyolite	7	0.1	4	35	55	5	<5	<10	248	<100	2	40					
7	do...	8	0.1	5	20	49	<5	<5	<10	102	<100	1	75	10	45	28		
9	Buff-green epidotized rhyolite	<5	<1	5	5	25	10	<5	<10	130	<100	1	<10					
* 14	Pinkish-buff silicified rhyolite	<5	0.2	28	22	128	7	<5	<10	47	<100	1	25	53	132	38		
15	do...	<5	0.2	9	48	37	17	<5	<10	172	<100	1	15	32	80	33		
17	do...	5	0.5	11	102	285	<5	<5	<10	980	<100	1	20	37	88	28		
45	Light gray silicified rhyolite	<5	<1	28	10	47	10	<5	<10	143	<100	1	<10	10	45	22		
46	Light gray quartz dacite flow	<5	<1	60	18	71	12	<5	<10	202	<100	1	<10	25	65	13		
48	Greenish-buff silicified rhyolite	<5	0.6	48	202	163	15	<5	<10	360	<100	2	<10	23	88	21		
50	Platy buff unaltered rhyolite	<5	0.5	48	25	778	13	<5	<10	38	<100	2	15	26	72	27		
55	Quartz latite; potassium feldspar	<5	<1	2	3	49	2.5	<5	<10	342	<100	1	<10	96	225	19		
61	Buff-colored limonitic rhyolite	<5	0.5	22	60	94	17	<5	<10	170	<100	4	25					
67	Buff plagioclase quartz latite	<5	0.2	9	77	118	<5	<5	<10	102	<100	1	<10	20	50	35		
68	Pink/tan plagioclase quartz latite	<5	0.1	9	24	39	<5	<5	<10	83	<100	1	<10	62	152	33		
69	Buff plagioclase quartz latite	<5	0.1	20	50	68	<5	<5	<10	140	<100	<1	<10	43	110	35		
71	Buff-colored Fe-stained rhyolite	15	0.3	15	21	32	15	<5	<10	65	<100	2	10	10	37	36		
72	Light green silicified rhyolite	<5	0.2	5	20	12	10	<5	<10	25	<100	3	10	10	42	35		
75	Whitish-buff kaolinized rhyolite	<5	<1	3	14	33	<5	<5	<10	85	<100	3	<10					
77	Buff porphyritic quartz rhyolite	<5	<1	4	24	15	<5	<5	<10	59	<100	0.5	<10	10	5	43		
87	Buff fine-grained rhyolite	<5	0.2	6	54	87	5	<5	<10	257	<100	1	<10	68	175	18		
89	Buff-colored quartz latite	<5	0.1	4	19	44	<5	<5	<10	50	<100	1	90	22	60	38		
90	Buff-colored rhyolite dike	<5	0.4	24	24	50	12	<5	<10	125	<100	4	<10	65	168	25		
* 92	Light buff Fe-stained rhyolite	<5	0.1	9	10	28	<5	<5	<10	155	<100	2	45	23	60	28		
* 98	Buff kaolinized rhyolite	<5	0.1	4	13	42	<5	<5	<10	147	<100	6	<10	42	118	22		
104	Pale green latite; Fe stained	<5	0.4	14	20	70	<5	<5	<10	212	<100	10	<10	20	55	15		
105	Pale green silicified latite	<5	1.2	11	14	17	<5	<5	<10	55	<100	9	70					
111	Greenish buff Fe-stained rhyolite	<5	0.2	28	12	165	6	<5	<10	118	<100	4	10	52	138	42		
* 112	do...	<5	1.8	78	9	287	<5	<5	<10	80	<100	4	20	10	40	31		
* 114	Buff limonite-stained rhyolite	<5	0.1	8	12	70	<5	<5	<10	40	<100	2	10	22	57	35		
* 115	Light gray rhyolite, weathers pink	<5	0.1	7	17	70	<5	<5	<10	57	<100	4	<10	10	5	47		
127	Buff-white K-feldspar rhyolite	<5	0.7	55	137	277	8	<5	<10	162	<100	2	65	35	90	19		
129	Whitish-buff quartz rhyolite	<5	0.2	5	35	62	<5	<5	<10	80	<100	3	120	25	65	30		

TABLE A-3. -- Trace-element analyses by rock type -- Continued

[< - less than; 1/2 of detection limit used to average undetected elements; wt - white; * whole rock table A-2]

Sample no.	Summary description	Mean concentration in parts per million (ppm), except as noted; [number of samples analyzed if less than total]															
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
TERTIARY RHYOLITE -- Continued:																		
Copper Mountain mineralized area -- continued:																		
158	Buff rhyolite; feldspar phenocrysts	<5	0.2	10	28	60	10	2.5	5	178	50	3	20	50	118	39		
168	Buff to pink porphyritic rhyolite	<5	0.3	21	90	192	47	2.5	5	178	50	1	20					
Mean concentration:		<5	0.9	19.7	37.9	107	7.7	<5	<10	159	<100	3.2	22	34.2	89.6	28.7		
TACTITE:																		
Copper Mountain mineralized area:																		
* 18	Chlorite, epidote, garnet tactite	<5	0.1	17	45	57	6	<5	5	178	<100	0.5	5	10	5	<5		
31	Epidotized calc-silicate gneiss	<5	4.7	402	532	5600	<5	<5	125	1425	115	6	5	37	95	25		
32	do...	75	86	7225	710	2.5%	<5	<5	620	2450	<100	8	195	10	30	10		
41	Calc-silicate garnet epidote skarn	10	0.6	15	213	568	12	<5	15	1020	100	1	25	35	90	13		
42	Garnet calc-silicate gneiss	<5	0.05	12	22	208	<5	<5	5	457	<100	1	5	46	112	16		
86	Tactite and minor biotite gneiss	<5	2.3	101	1535	1262	<5	<5	30	850	<100	5	25					
101	Fine-grained epidote-rich tactite	<5	0.1	8	34	130	<5	<5	5	560	<100	3	10					
131	Garnet epidote quartzite skarn	67	63	7120	2.3%	1.5%	<5	<5	340	3600	<100	4	30					
* 138	Garnet epidote quartz skarn	8	11	722	1.3%	1.4%	<5	<5	320	2050	<100	4	30	10	20	5		
145	Greenish gray tactite	<5	52	3190	1.8%	3.6%	5	<5	950	1.3%	<100	1	310	68	170	10		
147	do...	<5	25	3520	2.0%	2.6%	<5	<5	450	8620	<100	12	45	25	61	19		
148	do...	5	525	9.5%	2.6%	2.2%	5	<5	335	6850	<100	10	35	10	32	18		
* 149	Porcelaneous metacarbonate/tactite	<5	60	2760	4480	5880	5	<5	112	4800	<100	15	10	65	162	55		
150	Calc-silicate gneiss	<5	45	6200	1.6%	2.0%	<5	<5	330	6010	<100	20	5	10	43	18		
151	Malachite stained tactite	<5	102	3.5%	2.4%	2.8%	<5	<5	440	6280	<100	8	10	10	22	8		
152	Tactite; Fe stns along fractures	<5	14	445	9450	4265	20	<5	165	6310	<100	22	10	10	25	5		
160	Garnet quartz epidote tactite	<5	4.6	105	4430	1.4%	<5	<5	250	5025	<100	5	55					
161	Quartz garnet epidote tactite	<5	38	2165	2.5%	1.4%	<5	<5	325	3520	<100	3	30	10	37	16		
164	Quartz epidote garnet tactite	<5	0.7	64	178	550	5	<5	10	878	<100	1	175	10	40	60		
165	do...	<5	18	885	4875	6950	6	<5	132	3800	<100	8	115	10	52	63		
166	do...	<5	5.6	1580	685	3.3%	10	<5	380	1565	260	12	10	22	58	18		
169	Epidote calc-silicate tactite	18	85	7425	170	3.3%	5	<5	905	4680	<100	20	80					
170	Sulfide-rich, epidotized tactite	18	46	2210	1.8%	1.9%	<5	<5	340	3850	<100	18	45	20	50	19		
173	Epidote tactite at granite contact	<5	1.8	160	1275	4180	<5	<5	70	4230	110	6	15	28	65	21		
175	Very silicified epidote tactite	<5	6.7	1572	15	1.6%	<5	<5	305	1560	110	12	15					
177	Green calc-silicate epidote skarn	45	116	1.1%	52	6.0%	32	<5	1810	3530	<100	75	150					
181	do...	95	118	8810	110	3.4%	10	<5	1150	2610	<100	25	135					
182	Green calc-silicate-rich skarn	10	112	7750	2880	2.8%	6	<5	1960	3450	<100	30	170					
183	Dark green epidote skarn	162	180	20000	84	3.7%	132	<5	5	395	<100	1	65					
Mean concentration:		19.2	59.4	7775	7406	1.73%	10.2	<5	410	3123	65.3	11.6	62.6	23.4	62	21		
CRETACEOUS GRANODIORITE (GD) AND QUARTZ MONZONITE (QM):																		
Copper Mountain mineralized area:																		
* 24	Medium/coarse-grained granite	<5	<0.1	2	3	26	2.5	2.5	5	67	50	1	5	35	90	<5		
30	Coarse-grained, pinkish white QM	5	0.7	140	16	260	20	2.5	15	125	50	5	5					
39	Medium/coarse-grained granite	<5	<0.1	11	9	71	18	2.5	5	162	50	1	5	20	48	6		
40	Gneissic pinkish white granite	<5	<0.1	7	5	42	45	2.5	5	220	100	<1	5					

TABLE A-3. -- Trace-element analyses by rock type -- Continued

[< - less than; 1/2 of detection limit used to average undetected elements; wt - white; * whole rock table A-2]

Sample no.	Summary description	Mean concentration in parts per million (ppm), except as noted; [number of samples analyzed if less than total]															
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
CRETACEOUS GRANODIORITE (GD) AND QUARTZ MONZONITE (QM)-- Continued:																		
Copper Mountain mineralized area -- continued:																		
43	10-ft-wide pegmatite dike	<5	<0.1	14	21	43	<5	<5	<10	145	<100	3	<10	10	5	11		
51	Fine/coarse-grained white granite	<5	0.1	14	36	146	<5	<5	<10	240	<100	2	<10	82	152	6		
52	do...	<5	<0.1	4	12	81	<5	<5	<10	188	100	1	<10	54	215	6		
* 100	Pegmatitic leucocratic granite	<5	0.8	16	26	36	7	<5	<10	72	<100	2	<10	10	45	7		
* 102	Fine/medium-grained white granite	<5	<0.2	10	16	41	<5	<5	<10	152	<100	4	20	45	116	5		
117	Medium-grained limonitic QM	<5	<0.2	23	18	26	12	<5	<10	106	<100	3	20					
* 123	Coarse-grained, pinkish white QM	<5	0.2	17	10	39	17	<5	<10	110	<100	5	<10	23	60	10		
132	Gray lit-par-lit granite injecta	<5	0.1	8	37	76	<5	<5	<10	262	<100	4	<10					
142	Medium-grained, propylitized QM	<5	<0.2	30	19	197	<5	<5	<10	118	<100	3	<10					
* 143	Coarse-grained foliate white QM	<5	0.8	28	134	136	<5	<5	<10	180	<100	8	<10					
146	Medium-grained flesh/white granite	<5	0.8	52	245	615	6	<5	12	345	<100	4	15	45	123	19		
152	Coarse-grained/pegmatitic, epidote	<5	0.6	67	283	590	8	<5	12	880	<100	2	35	25	65	5		
Mean concentration:		<5	0.3	26	53	144	9	<5	<10	203	<100	3	9.1	39	101	8		
Klk Mountain mineralized area:																		
Gold Coin prospect:																		
192	Highly silicified, epidotized QM	<5	<0.1	5	4	20	125	<5	<10	58	<100	<1	<10	26	67	10		
* 193	Medium/coarse- GD, top Klk Mtn	<5	<0.1	5	2	19	35	<5	<10	97	<100	1	<10	34	92	5		
195	Coarse-grained granite float	<5	<0.1	15	13	16	<5	<5	<10	102	<100	2	<10	10	35	5	<20	
198	Medium/coarse-grained propylitized	<5	<0.1	16	4	45	17	<5	<10	150	<100	1	<10	50	128	15		
Shorty prospect:																		
200	Sericitized and silicified granite	<5	<0.1	6	9	6	5	<5	<10	85	<100	1	<10	10	43	53	<20	
201	do...	7	0.6	16	18	52	<5	<5	<10	84	<100	<1	10	<20	40	10		
208	Granite; local muscovite, epidote	<5	<0.1	6	14	58	<5	<5	<10	128	<100	1	<10	27	70	25		
209	Sericitized (cloudy feld.) granite	10	0.7	22	58	38	15	<5	<10	195	<100	2	10	25	63	10		
Stanley Ace prospect:																		
* 216	Biotitic medium-grained/pegmatite	<5	<0.1	9	6	330	33	<5	<10	201	<100	1	<10	83	218	33		
217	do...	25	<0.1	10	7	63	225	<5	<10	198	<100	1	10	52	137	33		
218	do...	<5	<0.1	23	15	742	65	<5	15	245	<100	2	<10	110	290	28		
* 222	Cream-wt muscovite granite injecta	<5	<0.1	7	13	24	50	<5	<10	66	<100	<1	<10	22	57	25		
226	do...	<5	0.1	13	16	34	46	<5	<10	72	<100	1	<10	40	102	8		
227	Cream-colored granite pegmatite	<5	0.1	16	7	52	45	<5	<10	83	<100	1	10	33	80	21		
229	Salmon-colored granite pegmatite	<5	<0.1	7	15	22	30	<5	<10	50	<100	2	<10					
Mean concentration:		<5	0.1	11.7	13.4	101	46.6	<5	<10	121	<100	1.2	<10	37	102	20	<20	
Observation Peak mineralized area:																		
Greenback mine:																		
231	Epidotized granodiorite, 10% quartz	<5	0.2	10	26	66	60	<5	<10	295	<100	1	5	32	80	13		
* 233	Biotite quartz monzonite	10	0.4	10	41	32	8	<5	<10	152	<100	4	15					
* 234	60% quartz monzonite, 40% quartz	15	16	7	620	145	30	<5	<10	43	<100	15	5	<20	<10	<5		
* 236	Silicified quartz monzonite	57	1.7	6	82	25	8	<5	<10	141	<100	4	10	<20	35	12		
* 238	Epidotized biotite granodiorite	<5	<0.2	3	24	188	6	<5	<10	295	<100	3	5					
* 239	Fresh biotite granodiorite	<5	<0.2	2	13	46	<5	<5	<10	270	<100	2	10					
241	Epidotized quartz monzonite	<5	0.7	4	25	58	60	<5	<10	280	<100	1	5	<20	30	6		

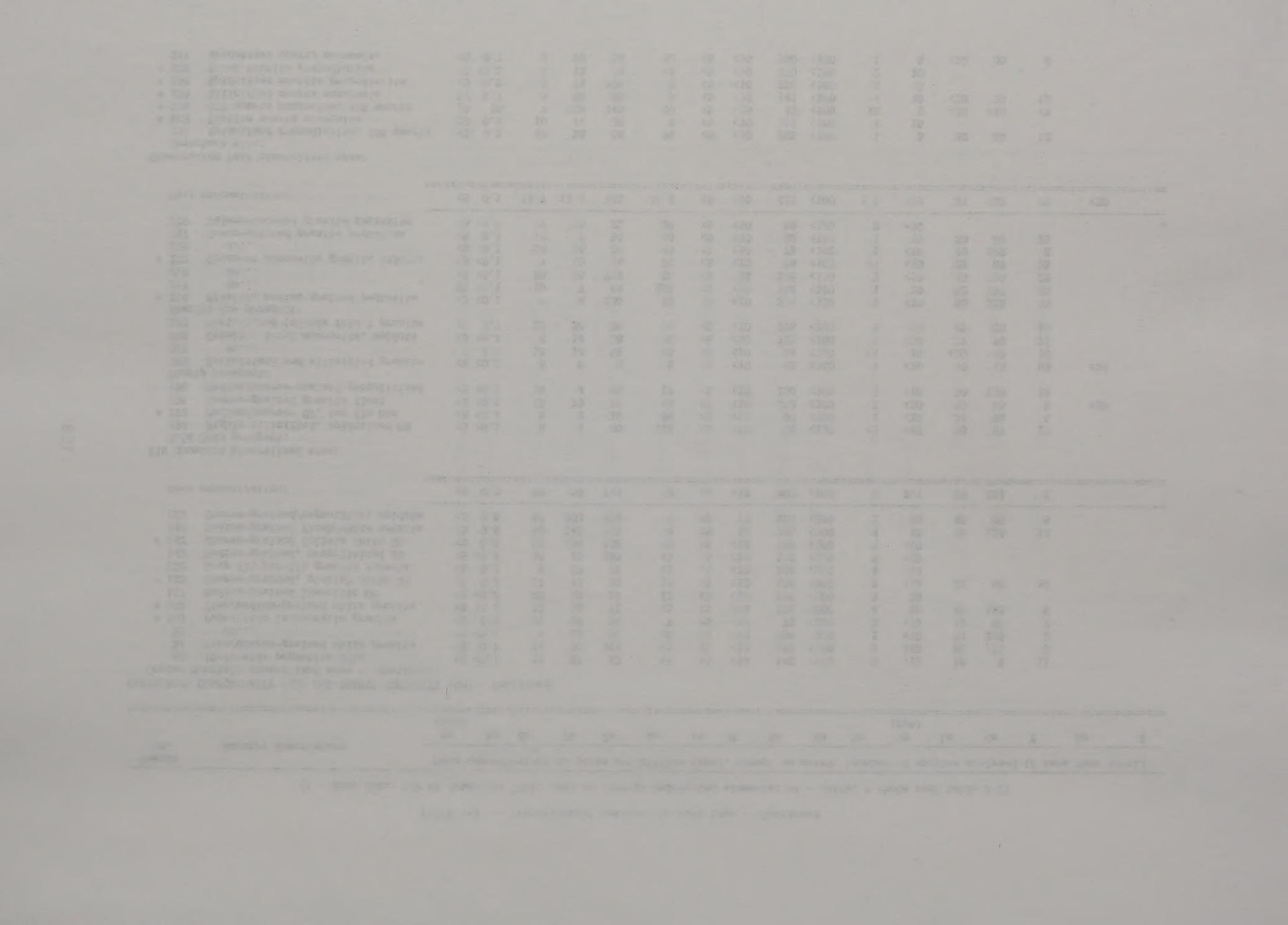


TABLE A-3. -- Trace-element analyses by rock type -- Continued

[< - less than; 1/2 of detection limit used to average undetected elements; wt - white; * whole rock table A-2]

Sample no.	Summary description	Mean concentration in parts per million (ppm), except as noted; [number of samples analyzed if less than total]															
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
CRETACEOUS GRANODIORITE/QUARTZ MONZONITE -- Continued:																		
	Greenback mine -- continued:																	
242	Epidotized white granite pegmatite	350	<0.2	3	26	15	197	<5	<10	81	<100	3	5	<20	25	9		
	Observation Peak:																	
* 244	Epidotized quartz monzonite	<5	0.5	16	173	395	40	<5	<10	2450	<100	1	15					
245	Porphyritic quartz monzonite	40	<0.2	3	15	36	<5	<5	<10	262	<100	3	5	<20	38	9		
* 246	Rhyodacite dike, local epidote	12	<0.2	3	34	45	<5	<5	<10	455	<100	3	5					
247	Kaolinized quartz monzonite	98	0.2	5	22	23	295	<5	<10	20	<100	2	5					
* 248	Epidotized quartz monzonite	33	<0.2	3	17	23	90	<5	<10	57	<100	3	5					
	Mean concentration:	48.3	1.6	5.8	86	84	61	<5	<10	369	<100	3.5	7.3	14	36	8.6		
	Miscellaneous prospects:																	
	Black prospect:																	
258	White hornblende biotite granodiorite	<5	0.2	5	10	55	<5	<5	<10	188	<100	2	35					
METASEDIMENT:																		
	Copper Mountain mineralized area:																	
4	Gray fine-grained calcareous gneiss	<5	<0.1	4	8	60	10	<5	<10	570	<100	1	135	44	120	25		
33	Fe-stained gray gneissic quartzite	<5	0.1	5	9	18	<5	<5	<10	52	<100	<1	10					
88	Slightly calcareous biotite gneiss	<5	1.0	43	245	490	8	<5	20	1750	<100	12	20	60	152	11		
91	Biotite gneiss; 20% quartzite	<5	1.1	49	230	292	7	<5	<10	820	<100	2	15	32	80	23		
119	White granite gneiss and quartzite	<5	0.1	15	11	26	<5	<5	<10	70	<100	1	<10	<20	36	13		
* 122	Carbonate metasediment, siderite	<5	0.1	10	9	50	8	<5	<10	415	<100	3	10	<20	25	15		
* 124	80% gneissic quartzite; phyllite	<5	0.2	7	13	40	10	<5	<10	268	<100	4	<10	<20	40	16		
125	Biotite schist and quartzite	<5	0.1	3	14	34	5	<5	<10	283	<100	2	<10	<20	5	<5		
133	75% gray quartzite, 25% injecta	5	3.2	270	110	1.3%	6	<5	265	2780	<100	8	25	23	60			
133	do...	5	0.4	8	38	61	<5	<5	<10	150	<100	4	15	27	80			
135	Silicified metacarbonate, siderite	<5	0.1	8	34	132	<5	<5	<10	960	<100	15	30	<20	22			
* 137	Light gray sugary quartzite	<5	0.2	11	62	72	<5	<5	<10	148	<100	5	10					
153	Light gray calcareous meta-carbonate	<5	0.5	63	142	510	6	<5	10	950	<100	3	<10	<20	37	16		
155	Calcareous biotite chlorite gneiss	<5	<0.1	14	32	198	6	<5	<10	580	<100	1	55	<20	32	18		
156	Pink gneissic quartzite	<5	7.5	650	3780	4980	5	<5	98	3600	<100	95	75	22	55	11		
157	Pink epidotized biotite gneiss	<5	0.6	101	170	515	10	<5	10	525	<100	2	<10	<20	40	18		
159	Calcareous silicified metasediment	<5	0.8	42	305	428	5	<5	12	2420	<100	90	<10	<20	32	18		
167	Foliated green metasediment; epidote	5	16	335	1.7%	1.3%	20	<5	320	1475	<100	10	40					
172	Quartz biotite gneiss; Fe stains	<5	0.3	47	58	156	<5	<5	<10	380	130	1	10	82	205	46		
174	Weakly foliated green quartzite	<5	0.7	106	11	1390	32	<5	32	238	<100	2	35	35	75	20		
176	Quartzite and minor tactite		7	55	3230	2.5%	5	<5	235	3240	<100	10	20	48	120	23		
185	Brownish gray quartzite, Fe-stains	<5	0.2	36	6	230	30	8	<10	160	<100	1	45					
186	do...	<5	0.3	69	8	195	15	<5	<10	322	<100	1	20					
187	Green medium-grained graywacke	8	0.3	47	13	450	90	<5	10	270	<100	2	40					
	Elk Mountain mineralized area:																	
	Gold Coin prospect:																	
190	White foliated arkosic quartzite	<5	<0.1	6	6	24	20	5	<10	42	<100	<1	<10	<20	<10	<5		
194	Greenish gneissic metasediment	<5	<0.1	3	20	95	12	<5	<10	417	<100	1	10	61	150	25		
196	4 ft graphite gneiss, 2 ft quartz	<5	<0.1	6	10	32	25	<5	<10	180	<100	1	<10	<20	38	5		
197	High grade graphite gneiss	<5	<0.1	33	25	310	28	<5	<10	99	<100	3	<10	35	95	19		

TABLE A-3. -- Trace-element analyses by rock type -- Continued

[< - less than; 1/2 of detection limit used to average undetected elements; wt - white; * whole rock table A-2]

Sample no.	Summary description	Mean concentration in parts per million (ppm), except as noted; [number of samples analyzed if less than total]															
		Au (ppb)	Ag	Cu	Pb	Zn	As	Sb	W	Mn	Ba	Mo	Hg (ppb)	La	Ce	Y	Be	U
METASEDIMENT -- Continued:																		
Elk Mountain mineralized area -- continued:																		
Shorty prospect:																		
201	Sericitized granite and gneiss	7	0.6	16	18	52	<5	<5	<10	84	<100	<1	10	<20	40	10		
202	Interlaminated gneissic quartzite	<5	<0.1	30	7	107	<5	<5	<10	186	<100	5	<10	<20	38	23		
203	Dark graphitic quartzite	10	0.1	7	16	121	<5	<5	<10	253	<100	1	10	20	52	14		
204	Greasy feeling graphitic quartzite	7	2.7	158	204	510	8	<5	10	218	<100	2	15	22	55	15		
206	Schistose biotite quartzite	<5	1.2	56	59	472	5	<5	10	98	<100	5	15	<10	25	24		
Stanley Ace prospect:																		
223	Cream-wt gneissic biotite quartzite	<5	<0.1	23	4	20	30	<5	<10	205	<100	1	<10	30	75	21		
224	Heavily Fe stained biotite gneiss	<5	0.1	32	5	30	32	<5	<10	140	<100	1	<10	42	110	20		
225	Silicified metasediment	<5	0.4	60	13	80	33	<5	<10	133	<100	2	15	32	85	<5		
228	Gray gneissic quartzite	<5	<0.1	29	8	24	30	<5	<10	38	<100	4	<10					

Table A-4. -- Directory of mining claims, Hanson Lakes study area, Idaho

Part 1. -- Copper Mountain mineralized area * (Custer County mining records):

Month	Day	Year	Claimant	Claim name	Book	Page
7	15	1902	Davis, F. Y.	Hawk	4	112
7	21	1902	Davis, F. Y.	Copper King #3-5	4	41-44
7	21	1902	Davis, F. Y.	Copper King Lode #1 & 2	4	40
7	8	1912	Hasbrouck, Ed	Allen	7	420
7	8	1912	Hasbrouck, Ed	Bicknell	7	426
7	8	1912	Hasbrouck, Ed	Coleman	7	424
7	8	1912	Hasbrouck, Ed	Collister	7	427
7	8	1912	Hasbrouck, Ed	Hasbrouck	7	421
7	8	1912	Hasbrouck, Ed	McAffee	7	428
7	8	1912	Hasbrouck, Ed	Ridenbaugh	7	425
7	8	1912	Hasbrouck, Ed	Roos	7	423
7	8	1912	Hasbrouck, Ed	Sullivan Lode	7	419
7	8	1912	Hasbrouck, Ed	Thorne	7	422
6	13	1917	Hasbrouck, Ed	Cape Horn Copper Mine	8	2
6	13	1917	Hasbrouck, Ed	Cape Horn Copper #1 & 3	8	1-4
1	8	1925	Taylor, C.F.	Eclipse #1 & 2	9	360
8	8	1925	Hurdle, Frank M.	Snowslide	9	367
9	7	1925	Robertson, C.L.	Copper King #1	8	461
7	13	1929	Taylor, C.F.	Siver Reef A-G	10	160-169
8	15	1929	May, J.A.	Carbonate Queen	10	181
1	1	1929	May, J.A.	Trimetal	10	183-190
8	11	1932	Otis, W.M.	One Leg #1-3	10	265
8	31	1932	Clark, Frank	Opportunity	10	265
9	16	1932	Clark, Frank	Summit Mining Claim	10	281
9	16	1933	McConnell, M.L.	Opportunity #2	10	296
10	4	1933	Hartshorn, A.H.	3.2	10	295
10	5	1933	Jensen, Henry	Hub #2	10	300
10	24	1933	Hartshorn, Ira	Hub		
8	29	1936	Neilson, J.H.	Pass Over #1-5	10	457-461
8	5	1939	Neilson, J.H.	Copper Lode	12	165
8	5	1939	Neilson, L.H.	Silver Queen	12	166
10	9	1939	Taylor, C.F.	Humming Bird	12	200-201
4	14	1943	Buchanan, Merritt & Darland, Jack A.	New Brenda	13	105
7	1	1947	Rice, George	Cape Horn #1	13	138
7	8	1948	Crutchley, H.T.	Thatcher Creek	13	245
6	23	1950	Crutchley, H.F.	Thatcher Creek #1-3	13	437-439
8	25	1950	Neilson, J.H.	Blue Sky	13	474
5	25	1951	Penrod, Harry	Custer Copper #5	13	511
5	25	1951	Penrod, Harry	Custer Copper #6-15	13	512-519
7	25	1955	Buchman, M.	Buchman #5-6	14	561
9	3	1955	Buchanan, M.	Buchanan #7-8	14	615-616
7	23	1956	Niece, Bonda	Copper Queen	15	135
7	23	1956	Niece, Bonda	Copper Queen #1	15	136
7	23	1956	Niece, Bonda L.	Silver Bell	15	133
7	23	1956	Niece, Bonda L.	Silver Bell #1	15	134
8	9	1965	Piva, Louie	Blue Jay #2-5	18	247-250
10	11	1966	Moline, Charles & Moline, Evelyn	Passover #0-5	18	383-385

* partial listing

Table A-4. -- Directory of mining claims, Bannon Lake study area, Idaho

Part I. -- Copper Bluff claim group (Custer County, mining records):

Month	Day	Year	Claimant	Claim name	Book	Page
7	15	1902	Davis, P. T.	Bluff	3	112
7	21	1902	Davis, P. T.	Copper King #3-5	4	41-44
7	23	1902	Davis, P. T.	Copper King Lode #1 & 2	4	40
7	5	1912	Vandevent, Jo	Alice	7	420
7	6	1912	Vandevent, Ma	Dutchess	7	420
7	6	1912	Vandevent, Ma	Ophelia	7	424
7	6	1912	Vandevent, Ma	Queen	7	427
7	8	1912	Vandevent, Ma	Quilter	7	427
7	8	1912	Vandevent, Ma	Quicksilver	7	428
7	8	1912	Vandevent, Ma	Rainbow	7	429
7	8	1912	Vandevent, Ma	Ruth	7	429
7	8	1912	Vandevent, Ma	Stockton	7	430
7	8	1912	Vandevent, Ma	Sunset	7	430
7	8	1912	Vandevent, Ma	Tidewater	7	431
7	8	1912	Vandevent, Ma	Zone	7	431
7	8	1912	Vandevent, Ma	Sullivan Lode	7	432
7	8	1912	Vandevent, Ma	Aurora	7	432
7	8	1912	Vandevent, Ma	Copper Blue	8	2
6	15	1917	Vandevent, Ma	Copper Blue #1 & 2	8	1-4
6	15	1917	Vandevent, Ma	Copper Blue #1 & 2	8	300
7	8	1905	Taylor, C.W.	Antipe #1 & 2	8	307
8	8	1906	Davis, Frank B.	Zenaida	8	691
8	7	1910	Nielsen, C.L.	Copper King #1	10	160-169
8	10	1910	Taylor, C.W.	Silver Belt A & B	10	161
8	11	1910	Clark, J.A.	Carbonate Queen	10	162-169
8	11	1910	Clark, J.A.	Trimetal	10	703
8	11	1910	Davis, M.E.	Ore Lot #1-5	10	702
8	11	1910	Davis, Frank	Copperbelt	10	701
8	10	1910	Clark, Frank	Summit Mining Claim	10	704
8	10	1910	Johnson, M.L.	Opportunity #2	10	705
8	10	1910	Clark, J.A.	3-5	10	706
8	1	1910	Jensen, Mary	Bob #2	10	707
10	5	1910	Thornton, Ira	Lib	10	707-901
10	11	1910	Nielsen, J.M.	Ross Mary #1-5	10	705
8	15	1910	Nielsen, J.M.	Copper Lode	12	706
8	5	1910	Nielsen, C.L.	Silver Queen	12	200-201
10	1	1910	Nielsen, C.L.	Mineral Blue	12	706
10	5	1910	Taylor, C.W.	Ima Dream	13	706
8	14	1910	Erickson, Henrik	A Copland, Jesse A.	13	706
9	1	1917	Rice, George	Lone Star #1	13	706
7	8	1910	Christley, W.F.	Thatcher Creek	13	706
6	23	1910	Crutchley, W.F.	Thatcher Creek #1-5	13	697-699
8	25	1910	Nielsen, J.M.	Rose Bay	13	674
5	28	1911	Pierce, Perry	Custer Copper #6	13	811
5	28	1911	Pierce, Perry	Custer Copper #6 13	15	812-814
5	28	1911	Pierce, Perry	Rainbow #5-6	14	807
7	25	1911	Erickson, H.	Rainbow #7-9	14	815-816
8	3	1911	Pierce, Perry	Custer Queen #6	15	722
7	22	1911	Nixon, Frank	Silver Belt	15	722
7	22	1911	Nixon, Frank	Silver Belt #1	15	723
7	22	1911	Nixon, Frank	Blue Jay #2-4	16	247-249
8	9	1911	Pierce, Perry	Reserve #6-8	16	249-250
10	11	1910	Nielsen, Charles	Reserve #6-8	12	249-250
			Nielsen, Evelyn			

* Partial listing

Table A-4. -- Directory of mining claims -- continued.

Part 2. -- Elk Mountain mineralized area * (Custer County mining records):

Month	Day	Year	Claimant	Claim name	Book	Page
8	5	1901	1/ Crawford, W.	Copper Jacket	3	605
8	11	1901	1/ Crawford, W.	Ajax	3	604
8	14	1901	1/ Caldwell, Frank & Crawford, W.	Black Giant	3	603
8	18	1901	1/ Bergheim, Joe	Colorado	3	548
6	14	1902	2/ B & B Syndicate	Muggins	4	50
6	14	1902	2/ Brim, J. A.	D.C.	4	66
6	14	1902	2/ Brim, J. A.	Westview	4	67
6	14	1902	2/ Brim, J. A.	Gladys	4	68
6	14	1902	2/ Brim, J. A.	Lakeview	4	69
5	12	1905	2/ Farr, J. E.	Elkida	5	247
5	12	1905	2/ Farr, J. E.	Elkida #1-5	5	248-252
7	17	1906	2/ Bryan, Will C.	Elkida #6-8	6	78-80
9	22	1906	2/ Farr, J.E.	Vermont	6	58
10	7	1907	3/ Benson, G. M.	Atlantic Cable	7	202
2	7	1910	2/ Smith, Charley	Saint Paul #1 & 2	6	247
2	21	1912	2/ Rasche, P. N.	Leap Year Quartz	6	336
9	28	1917	3/ Benzer, John	Molybdenum #1 & 2	8	44-42
10	14	1919	2/ Rasche, P. H.	Lakeview	6	637
9	11	1922	Querey, Edwin	Gold Coin #1-3	8	254-256
6	21	1930	2/ Rasche, P. H.	Lucky Monday	11	334
7	3	1930	2/ Rasche, P. H.	Lucky Monday #1	11	352
8	20	1933	2/ Model, Carl	Dures Mixture	11	508
10	3	1936	3/ Rose, W. L.	Molly Bum	10	474
4	20	1940	3/ Shay, Kenneth	Lucky Monday #1-3	12	252-254
8	8	1947	Moore, George	Marley Moore	13	168
7	31	1951	Danner, Archie	Stanley Ace #1	13	545
6	19	1956	Olson, Joel	Stanley Ace #2	15	114
6	19	1958	1/ Deglar, C. M.	Blue Bell	15	635
6	19	1958	1/ Deglar, C. M.	Blue Bell #2 & 3	15	637-639
8	2	1967	1/ Niece, Jack & Ruth	Copper #1-3	19	91
6	28	1968	Niece, Jack & Ruth	Shorty #1-4	20	392-400
9	10	1968	Niece, Jack & Ruth	Shorty	Microfilm no. 125582	

* partial listing
1/ precursor, adjacent claim, or alternate name of the Shorty claim group
2/ precursor or alternate name of the Stanley Ace claim group
3/ precursor, adjacent claim, or alternate name of the Gold Coin claim group

Table A-4. -- Directory of mining claims -- continued.

Part 3. -- Observation Peak mineralized area * (Custer County mining records):

Month	Day	Year	Claimant	Claim name	Book	Page
Pre-1900: unrecorded prospects on south face Observation Peak [Omaha Gulch]						
7	21	1903	1/ Livingston, N. E.	Alturas	4	572
8	20	1903	1/ Livingston, N. E.	John P.	4	571
9	1	1903	1/ Livingston, N. E.	Bunker Hill	4	570
9	1	1903	1/ Livingston, N. E.	Junction	3	573
9	1	1903	1/ Livingston, N. E.	Jump Off	4	574
10		1903	1/ Hopkins, W. I.	Mammoth lode	5	163
10	5	1903	1/ Hopkins, W. I.	Lower Mammoth lode	5	164
10	5	1903	1/ Hopkins, W. I.	Yankee Hill	5	165
7	30	1907	1/ Livingston, N. E.	Annex [St. Joe Lead Co.]	7	215
8	5	1907	1/ Livingston, N. E.	Hard Luck	7	213
8	5	1907	1/ Livingston, N. E.	Hard Times	7	214
7	9	1915	Benzer, John K.	Olympic [Boise County--notice on site]		
9	12	1917	2/ Benzer, John	Trojan	8	9
9	12	1917	2/ Benzer, John	Titan	8	9
		1936	1/ Olson; Stanley, Joel, and James	Dawn Ridge [Joel Olsen, oral communication, 1991]		
7	2	1948	Trainoff, Harry	Greenback #1-3	13	239-41
8	1	1948	Trainoff, Harry	Greenback #4-59	13	286-335
		1949	3/ Cooper, William E.	Plumb Bob [Killsgaard and others, 1970]		
		1952	Trainoff, Harry	Greenback mine patented		
		1954	USFS	purchases back Greenback		
3	7	1963	2/ White, Mrs. Ken & Baily, Mrs. F.	Oomyakken Bakk, Bailite, and Jolly Dozen	17	645-647
6	4	1964	2/ Vanvig, Lester & Bailey, Fred	Scorpion group	18	81-100

* partial listing
1/ Precursor to the Greenback mine
2/ West and northwest of Observation Peak between the Olympic and the ridge dividing Silver and Stanley Lake Creeks
3/ A late name for the Olympic

Part 4. -- Miscellaneous lode claims * (Custer and Boise Counties, respectively):

Month	Day	Year	Claimant	Claim name	Book	Page
8	15	1964	Murdock, Geary J.	Shirley Ann #1-4	18	130-133
3	17	1980	Karr, Peter [Bar K Mining Co.]	Bear Creek #1-15	40	84-98

* partial listing

Table A-4. -- Directory of mining claims -- continued.

Part 2. -- Conservation Peak memorialized area - (Custer County claims recorded):

Month	Day	Year	Claimant	Claim name	Book	Page

Table A-4. -- Directory of mining claims -- continued.

Part 5. -- Placer Claims from the Hansen Lakes Study Area *
(Custer and Boise Counties):

Month	Day	Year	Claimant	Claim name	Book	Page
11	13	1894	Mandell, F.C.	Wyandotte Consolidated	7A	170
7	10	1905	Farr, J.C.	Lakeview Placer	3	119
6	20	1906	Fruit, D.R.	Wondering Girl	3	150
6	20	1906	Fruit, D.R.	Cape Horn Placer	3	151
7	20	1908	Collins, J.M.	Elk Creek Placer Claim	3	364
10	1	1919	Frost, Willard	Mountain Gem	3	522
9	4	1923	McAllister, Robert	Invietos	3	583
9	10	1923	McAllister, Robert	Idaho Girl	3	575
3	5	1924	McAllister, Robert	Idaho Girl #1-7	3	576-582
3	5	1924	McAllister, Robert	Idaho Girl #8-11	3	585-588
11	17	1924	Allen, H.J.	Gooding Placer #1	3	628-629
11	24	1924	Allen, H.J.	Gooding Placer #2, 3, 4		630-634
6	19	1925	Robertson, C.D.	Banner #1	4	6
6	20	1925	Robertson, C.J.	Deer Lick #1	4	5
8	8	1931	Rowley, James	Elk Creek #1	4	203-204
8	8	1931	Rowley, James	Elk Creek #2	4	204-205
8	8	1931	Rowley, James	Elk Creek #3	4	205-206
6	5	1932	Fenstermaker, F. M.	Meadow Creek mine	10	261
9	6	1932	Rowley, Emma	Elk Creek Placer Claim	4	269
7	1	1936	Querry, Robert	Valley Creek Placer #1	4	450
7	21	1936	Querry, Robert	Unnamed	4	487
8	16	1936	Rose, W.L.	Lost Mine #2	4	497-498
4	7	1951	Jarvas, W.J.	Cape Horn Groups #1-6	5	461-467
4	7	1951	Jarvis, W.J.	Cape Horn Placer #7-22	5	471-481
4	7	1951	Jarvis, W.J.	Swamp Creek Placer #1	5	459-460
4	7	1951	Jarvis, W.J.	Swamp Creek Placer #2	5	460-462
9	4	1954	Jarvis, W.J.	Swamp Creek Plac. #3 & 4	6	27
4	21	1951	Shelton, Jack	Junction #1	5	468
6	4	1951	Shelton, Jack	Junction #2	5	469
6	4	1951	Shelton, Jack	Junction #3	5	470
6	18	1952	Morcom, Herb	Claim No. 1-5	5	495-500
9	9	1953	Hahn, H.W.	Doris No.1	5	571
9	9	1953	Hahn, H.W.	Jean #1 & 2	5	574
9	9	1953	Hahn, H.W.	Leonard #2	5	573
9	12	1953	McDowell, W.R.	Bull Trout Group #1-11	5	576-586
9	21	1953	Hahn, H.W.	Leonard #1	5	572
9	4	1954	Jarvis, W.J.	Swamp Creek #3 & 4	6	27
8	31	1956	McDermott, Lyle C.	Meadow Creek Group #1-4	6	134-135

* partial listing

Table 7-4. -- Directory of mining claims -- continued.

Part B. -- Placer Claims from the Human Lode Study Area *
(Taylor and Boise Counties)

Sketch	Sec	Twsp	Claimant	Claim name	Book	Page
1	15	1004	Woodell, P.C.	Pay-Rite Consolidated	7A	170
2	10	1805	Farr, J.C.	Lucrative Placer	3	112
4	22	1705	Scott, D.E.	Wandering Girl	3	180
5	25	1804	Fritz, B.E.	Cave Area Placer	3	181
7	25	1700	Collins, J.R.	Elk Creek Placer Claim	3	364
10	1	1810	Frost, William	Mountain Gem	3	422
3	4	1802	Mallister, Robert	Invisible	3	320
9	10	1825	Mallister, Robert	Jade Girl	3	378
3	1	1824	Mallister, Robert	Idaho Girl #1-7	3	376-382
8	1	1824	Mallister, Robert	Idaho Girl #8-11	3	383-388
11	11	1824	Allen, R.L.	Cowlitz Placer #1	3	429-433
11	24	1824	Allen, R.L.	Cowlitz Placer #2, 3, 4		430-434
2	15	1802	Robertson, C.D.	Beaver #1	4	8
4	20	1804	Robertson, C.L.	Deer Lick #1	4	9
6	2	1801	Conley, James	Elk Creek #1	4	203-204
7	2	1801	Conley, James	Elk Creek #2	4	204-205
7	8	1801	Conley, James	Elk Creek #3	4	205-206
2	1	1804	Fredericksen, P. H.	Moscow Creek Mine	10	201
4	4	1802	Conley, James	Elk Creek Placer Claim	4	202
7	1	1804	Cherry, Robert	Valley Creek Placer #1	4	450
7	12	1801	Cherry, Robert	Unnamed	4	497
12	12	1802	Ross, W.L.	Last Mine #2	4	497-498
4	7	1804	Jarvis, W.L.	Cape Horn Canyon #1-8	5	103-107
4	7	1804	Jarvis, W.L.	Cape Horn Placer #7-22	5	271-281
4	7	1804	Jarvis, W.L.	Stamp Creek Placer #1	5	459-469
4	7	1804	Jarvis, W.L.	Stamp Creek Placer #2	5	680-682
9	4	1804	Jarvis, W.L.	Stamp Creek Placer #3 & 4	6	27
2	27	1804	Fullen, Jack	Junction #1	5	458
2	4	1801	Chilton, Jack	Junction #2	5	460
9	4	1801	Chilton, Jack	Junction #3	5	470
8	10	1804	Pearson, Herb	Claim #1-3	5	498-500
9	3	1805	Hahn, R.W.	Lorin No.1	5	571
8	8	1804	Hahn, R.W.	Jean #1 & 2	5	574
8	9	1804	Hahn, R.W.	Leonard #2	5	573
9	12	1803	McDowell, M.E.	Mill Trout Group #1-11	5	678-688
9	21	1803	Hahn, R.W.	Leonard #1	5	572
8	1	1804	Jarvis, W.L.	Stamp Creek #5 & 6	6	27
8	34	1804	McDonnell, Lyle O.	Meadow Creek Group #1-4	6	134-138

* Partial listing

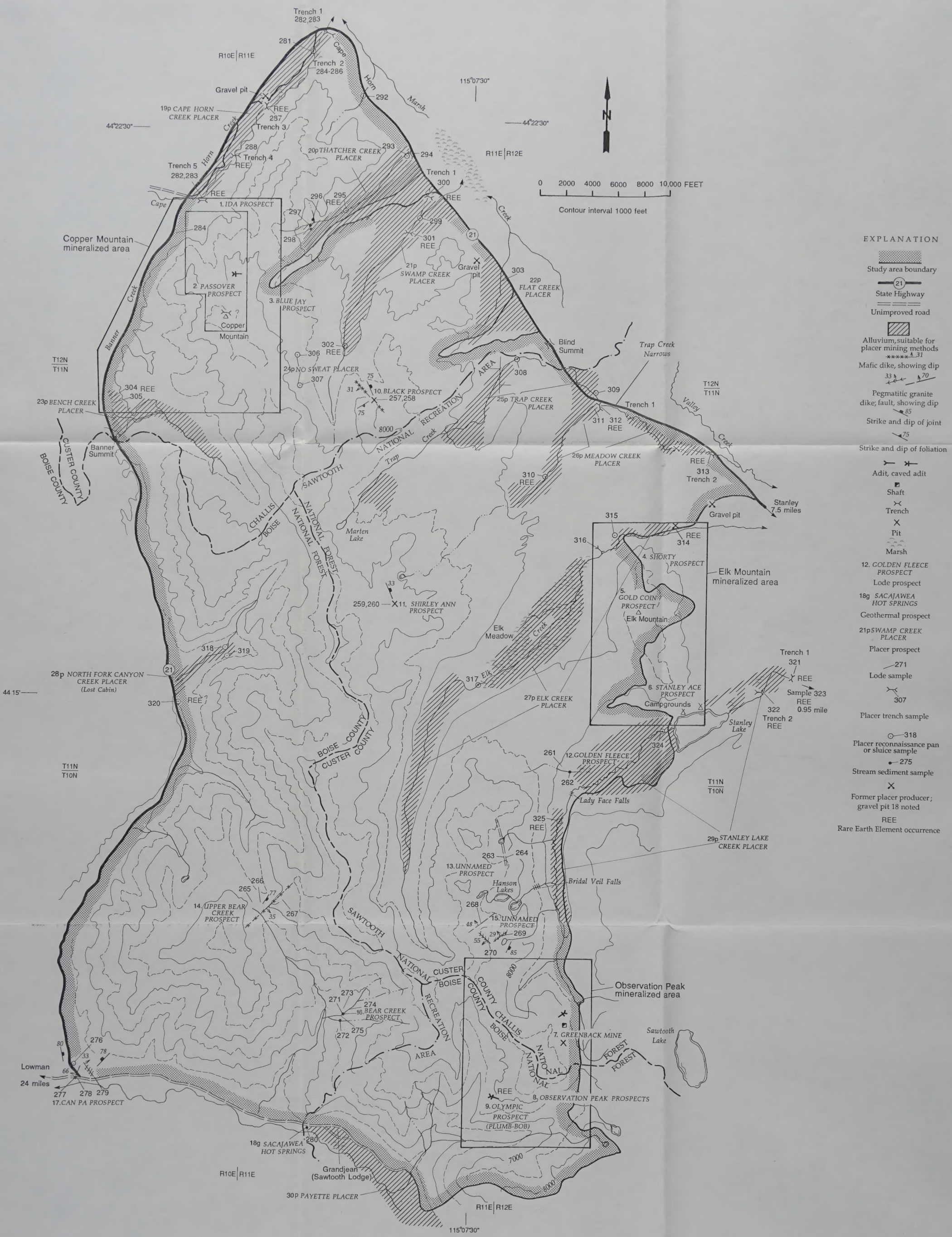


Plate 1.- Mineralized areas and miscellaneous prospects, Hanson Lakes study area, Boise and Custer Counties, Idaho

Trench 1
282,283
281
R10E | R11E
Trench 2
284-286
Cape Horn
Gravel pit
19p CAPE HORN CREEK PLACER
Creek
REE
287
Trench 3
44°22'30"
Horn
288
Trench 4
REE
Trench 5
282,283
REE
Cape
1. IDA PROSPECT
284
Copper Mountain mineralized area
Creek
Banner
2. PASSOVER PROSPECT
Copper Mountain
3. BLUE JAY PROSPECT
297
296
295
REE
298
292
Marsh
115°07'30"
44°22'30"
N
R11E | R12E
20p THATCHER CREEK PLACER
293
294
Trench 1
300
REE
0 2000 4000 6000 8000 10
Contour interval 1000 feet
Creek
299
301
REE
21
21p SWAMP CREEK PLACER
Gravel pit
303
22p FLAT CREEK PLACER
Blind Summit
302
REE
306
24p NO SWEAT PLACER
307
T12N
T11N
304 REE
305
23p BENCH CREEK PLACER
CUSTER COUNTY
BOISE COUNTY
Banner Summit
75
31
10. BLACK PROSPECT
257,258
75
8000
NATIONAL RECREATION AREA
308
309
25p TRAP CREEK PLACER
Trench 1
311 312
REE
Trap Creek
Narrow
26p MEADOW CREEK PLACER
Trap Creek
310
REE
SAWTOOTH
CHALLIS
BOISE
NATIONAL FOREST
Marten Lake
315
316
4. SHO
5. GOLD COIN PROSPECT
Elk Mounta
6. ST
Camp
33
259,260
11. SHIRLEY ANN PROSPECT
Elk Meadow
Creek
318
319
317 Elk
27p ELK CREEK PLACER
28p NORTH FORK CANYON CREEK PLACER
(Lost Cabin)
44 15'
320
REE
BOISE COUNTY
CUSTER COUNTY
T11N
T10N
261
12. GOLDEN FLEECE PROSPECT
262
Lady Face Falls
325
REE
263
264
13. UNNAMED PROSPECT
Hanson Lakes
Bridal Veil Falls
268
15. UNNAMED
266
265
77
35
267
14. UPPER BEAR CREEK PROSPECT
SAWTO

,000 FEET

reek
ws

T12N
T11N

Valley

Creek

REE
313
Trench 2

Stanley
7.5 miles

Gravel pit

REE
314

RTY
PROSPECT

Elk Mountain
mineralized area

ANLEY ACE
ROSPECT
grounds

Trench 1
321

REE

Sample 323
REE
0.95 mile

322
Trench 2
REE

Stanley
Lake

T11N
T10N

29p *STANLEY LAKE*
CREEK PLACER

EXPLANATION

Study area boundary

21 State Highway

Unimproved road

Alluvium, suitable for placer mining methods

31 Mafic dike, showing dip

33 70 Pegmatitic granite dike; fault, showing dip

85 Strike and dip of joint

75 Strike and dip of foliation

Adit, caved adit

Shaft

Trench

Pit

Marsh

12. *GOLDEN FLEECE PROSPECT*
Lode prospect

18g *SACAJAWEA HOT SPRINGS*
Geothermal prospect

21p *SWAMP CREEK PLACER*
Placer prospect

271 Lode sample

307 Placer trench sample

318 Placer reconnaissance pan or sluice sample

275 Stream sediment sample

Former placer producer; gravel pit 18 noted

REE
Rare Earth Element occurrence

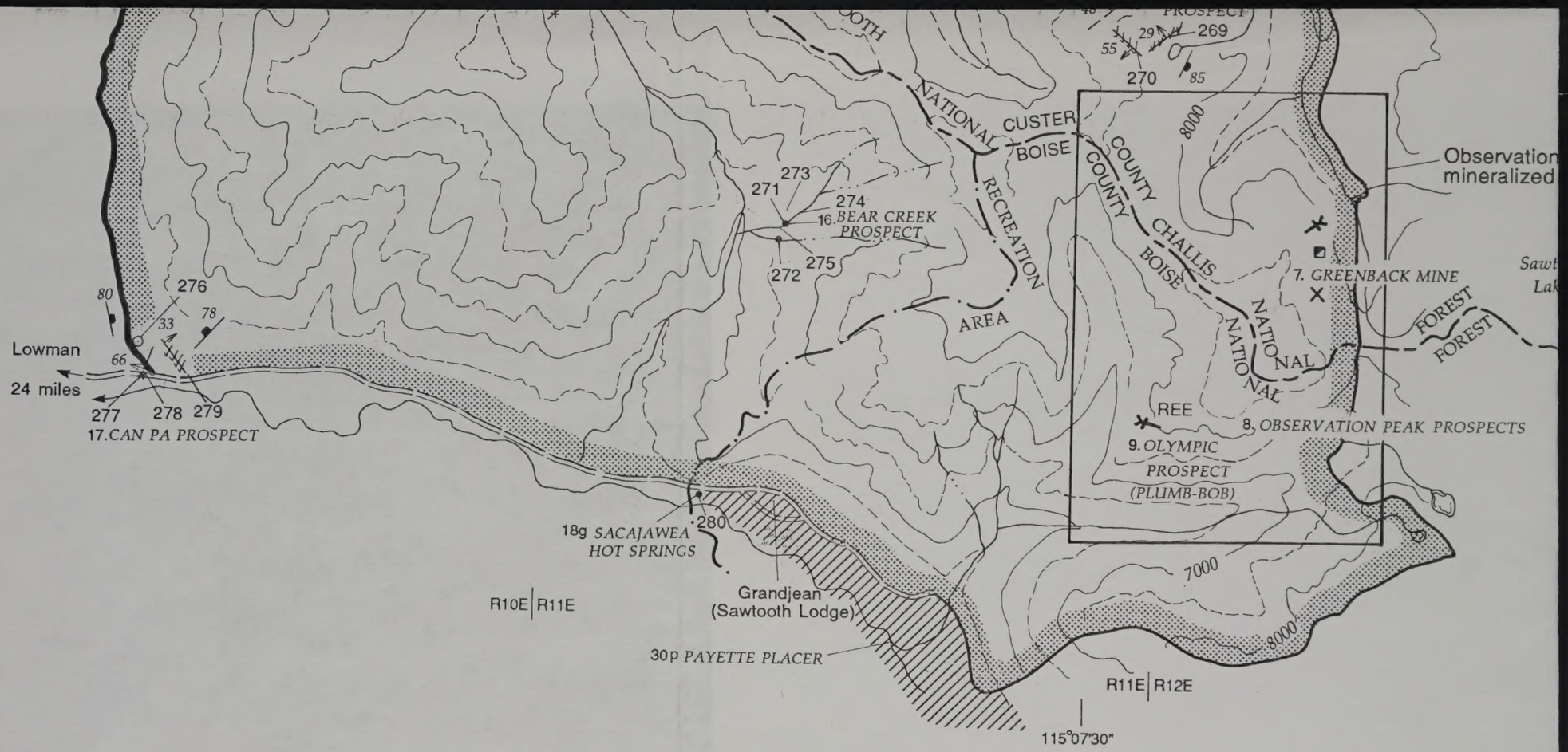
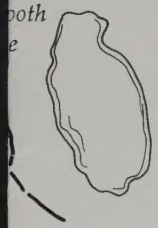


Plate 1.- Mineralized areas and miscellaneous prospects, Hanson Lakes study area, Boise and Custer Counties, Idaho

Peak
area

oth
e



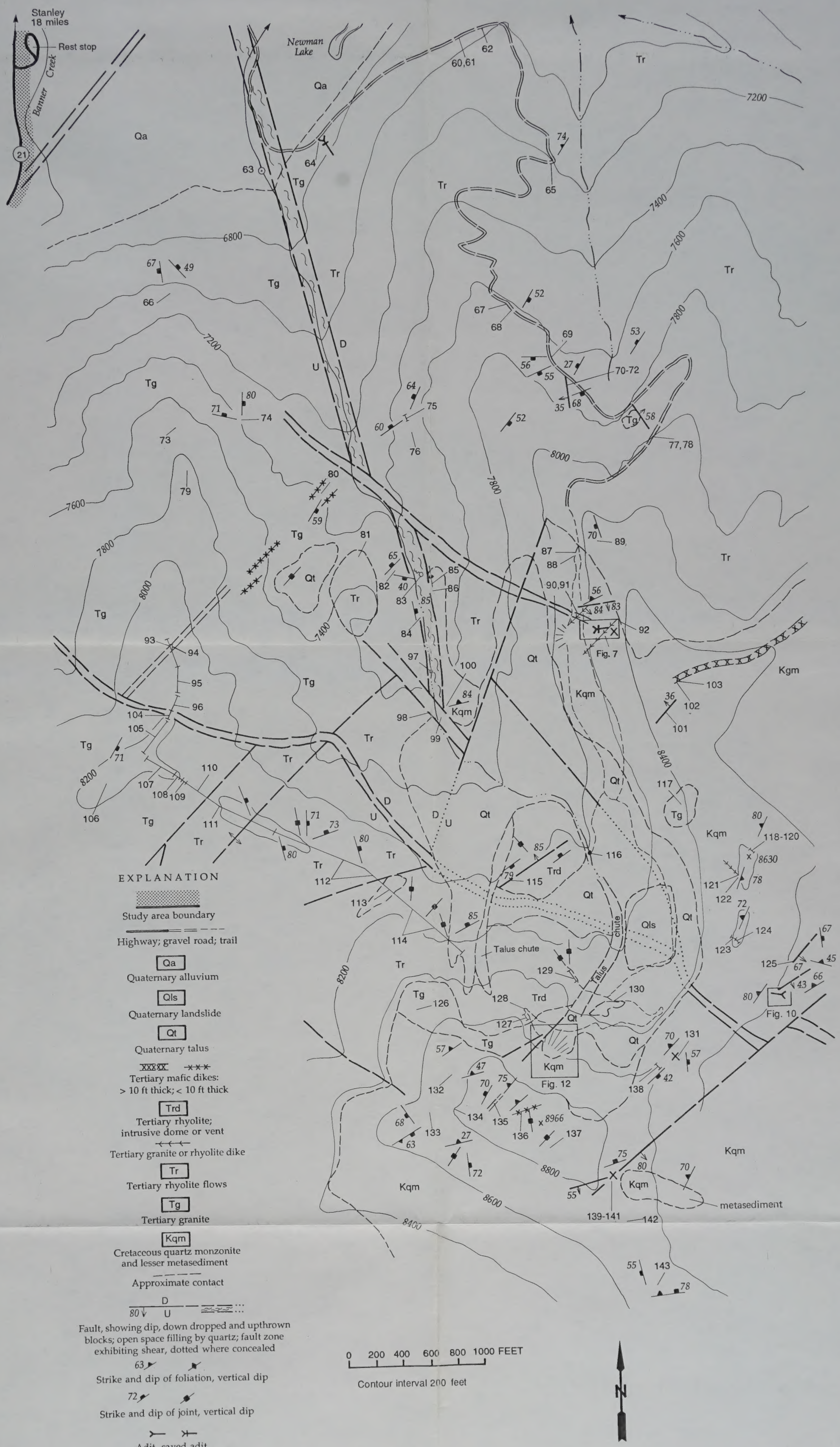
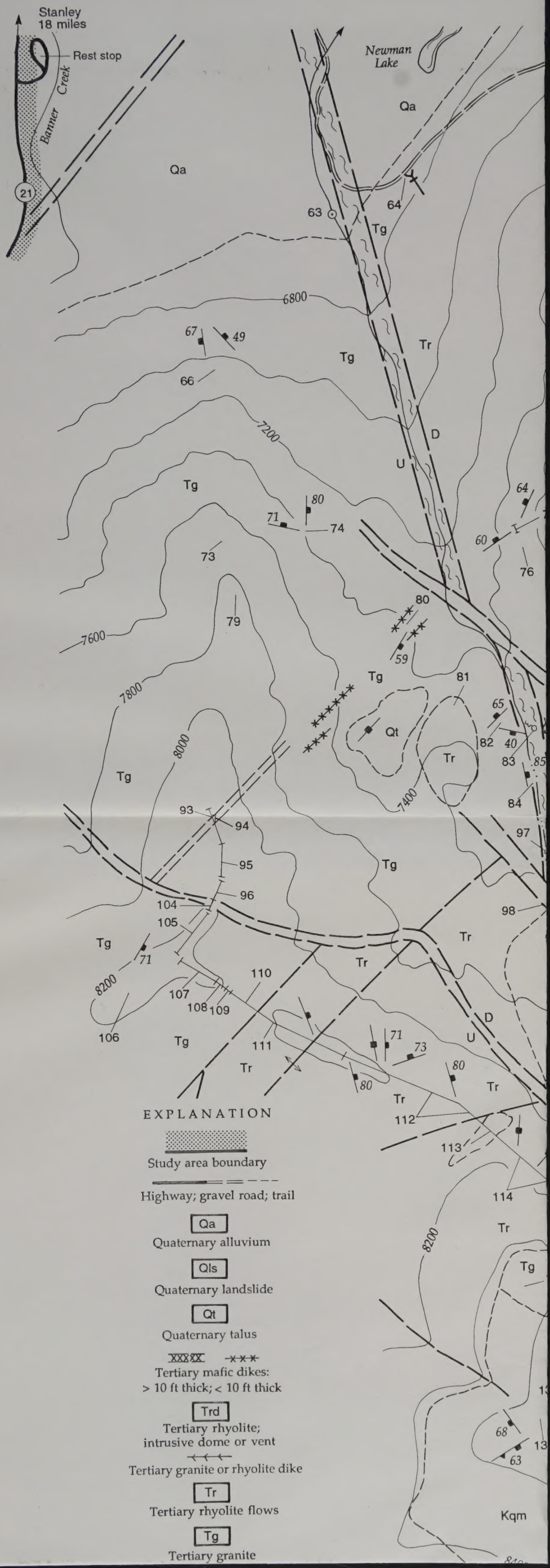


Plate 2.- Sample localities and geology at the Passover claim group, Hanson Lakes study area, Boise and Custer Counties, Idaho



EXPLANATION

Study area boundary

Highway; gravel road; trail

Qa
Quaternary alluvium

Qls
Quaternary landslide

Qt
Quaternary talus

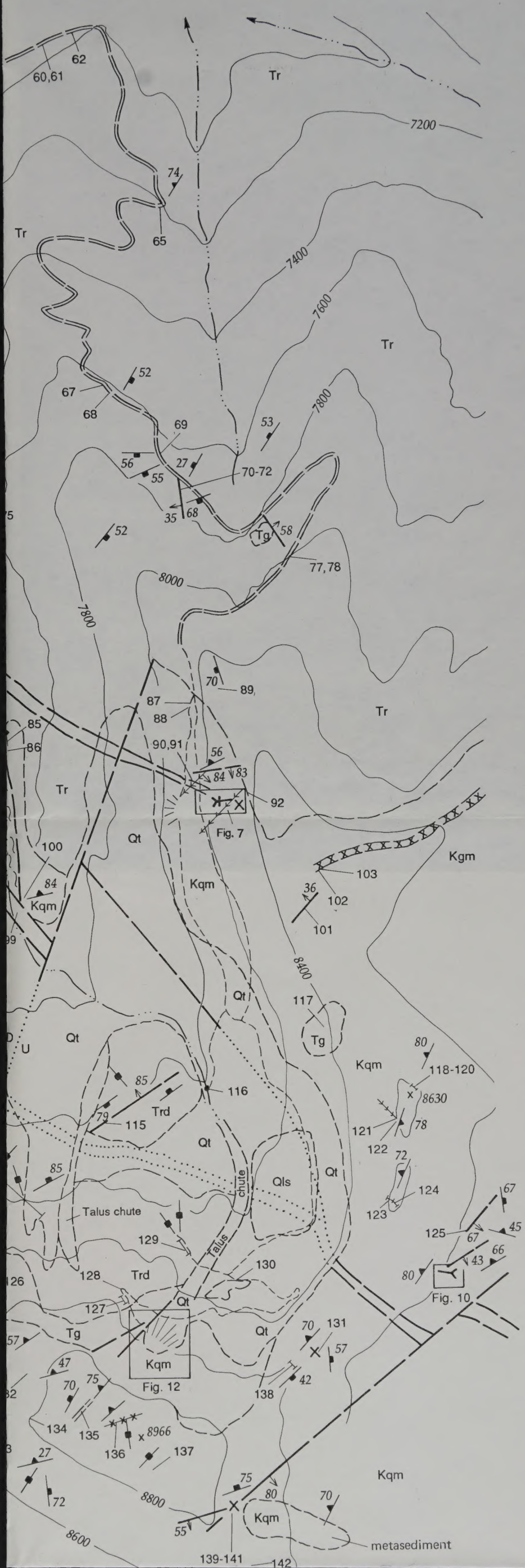
Tertiary mafic dikes:
> 10 ft thick; < 10 ft thick

Trd
Tertiary rhyolite;
intrusive dome or vent

Tertiary granite or rhyolite dike

Tr
Tertiary rhyolite flows

Tg
Tertiary granite


62
60,61
Tr
7200
74
Tr
65
7400
7600
Tr
52
67
68
69
53
7800
56
27
55
70-72
35
68
52
Tg
58
77,78
8000
7800
70
89
87
88
85
86
90,91
56
84
83
92
Fig. 7
Tr
Qt
100
84
Kqm
Kqm
103
36
102
101
Kgm
8400
Qt
117
Tg
Qt
U
80
Kqm
118-120
8630
85
116
Trd
79
115
121
78
122
Qt
72
85
Qls
Qt
chute
124
123
Talus chute
129
Talus
130
67
125
45
67
66
43
80
Fig. 10
128
Trd
127
Qt
Tg
Qt
70
131
57
Kqm
Fig. 12
47
70
75
138
42
134
135
8966
136
137
27
72
Kqm
75
80
70
8800
55
Kqm
8600
metasediment
139-141
142

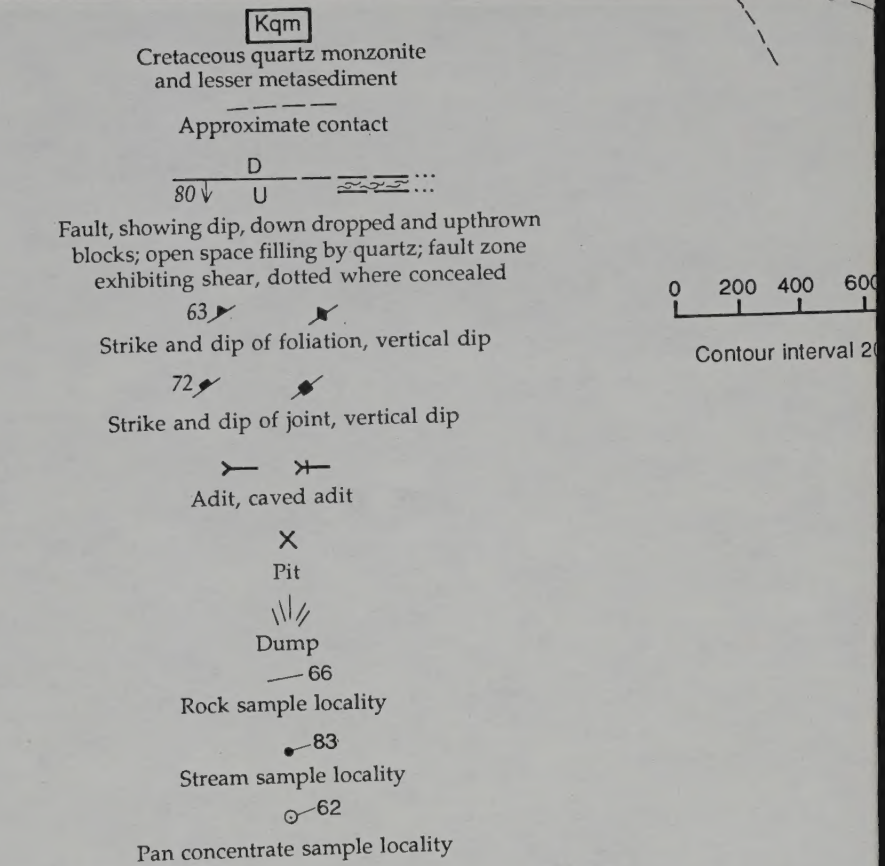
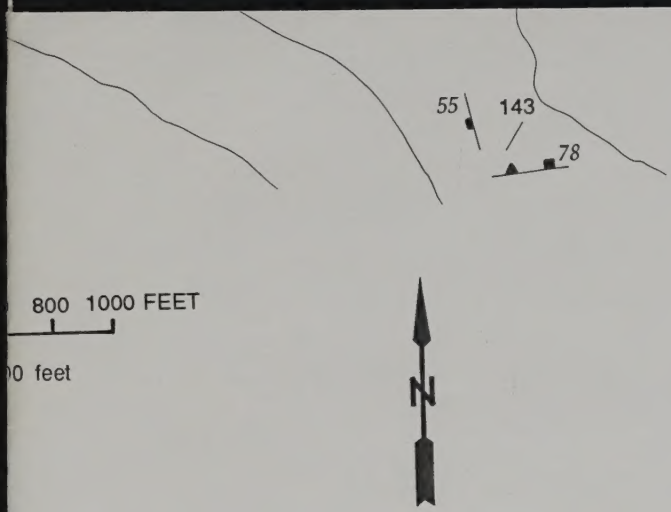
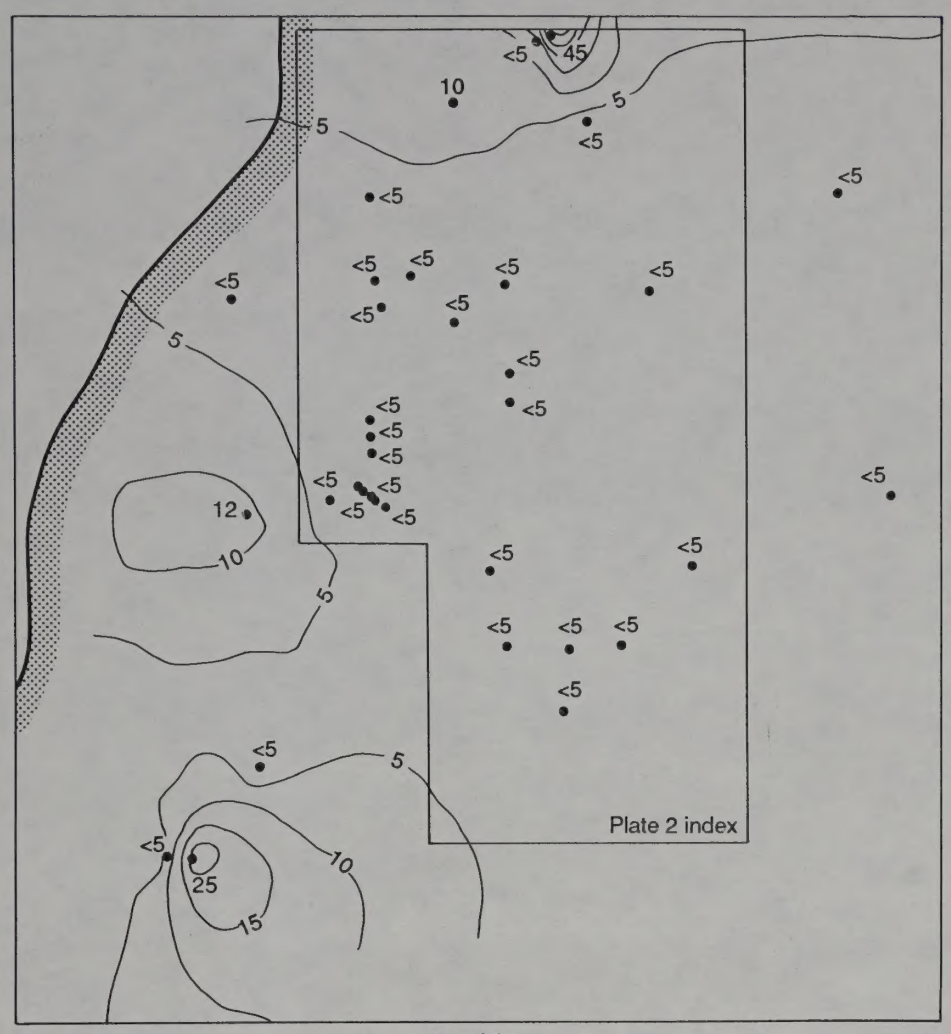


Plate 2.- Sample localities and geology at the Passover claim grou



, Hanson Lakes study area, Boise and Custer Counties, Idaho

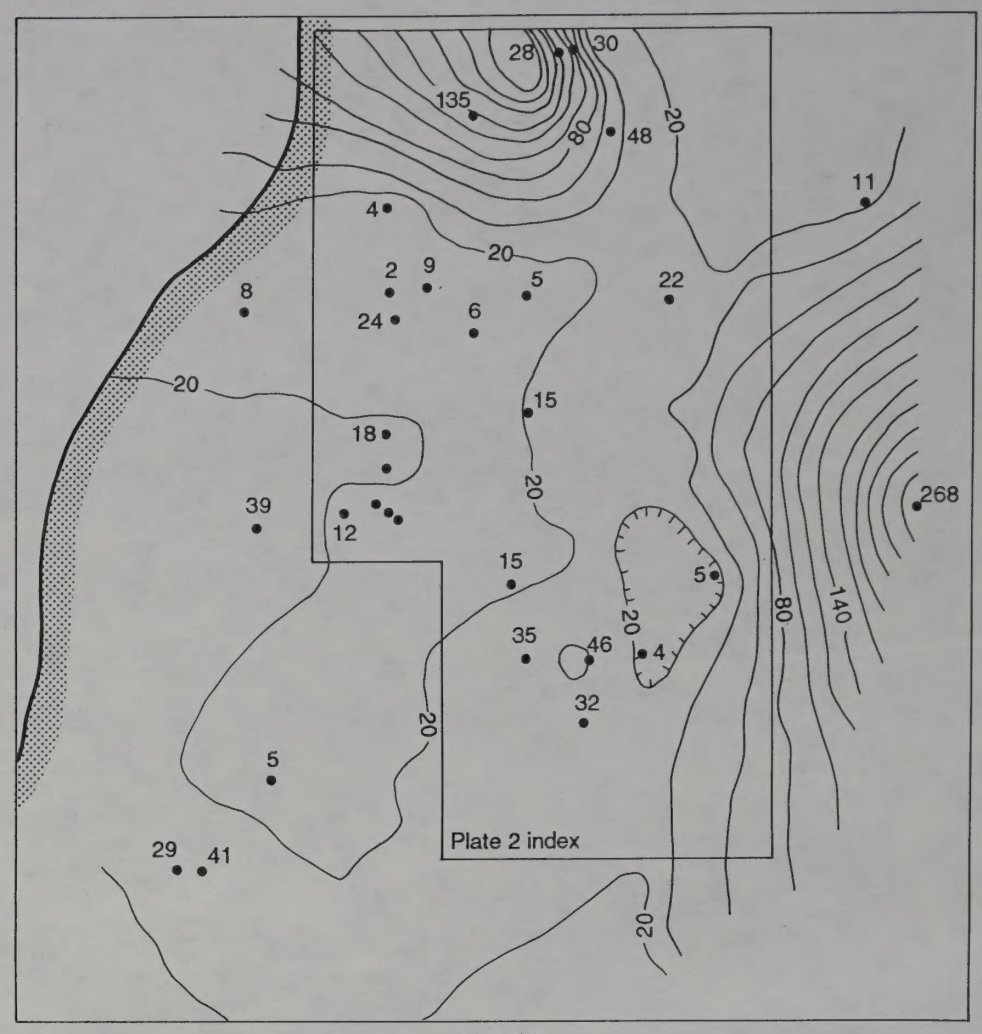


Panel 1

Gold in Tertiary granite samples
posted concentrations in ppb
Study area boundary

N

0 1000 2000 FEET

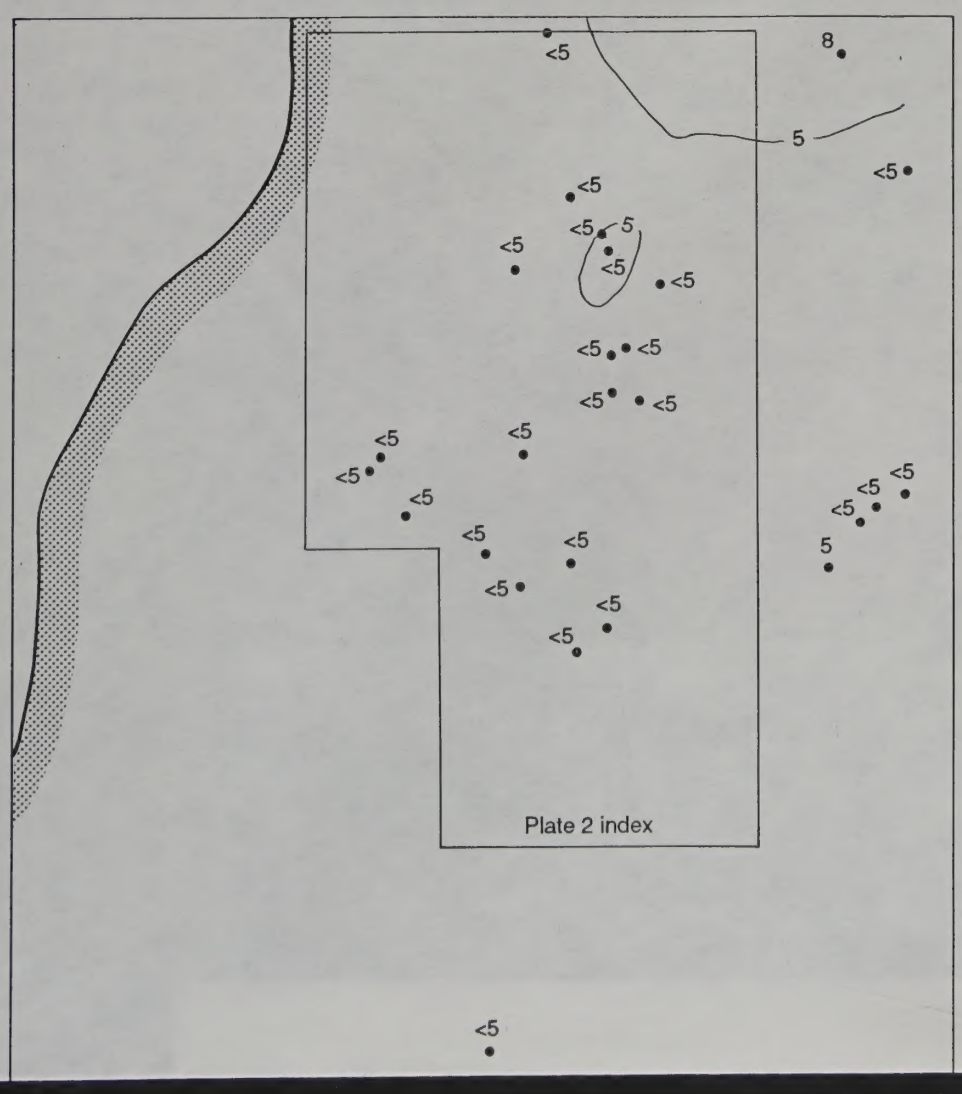


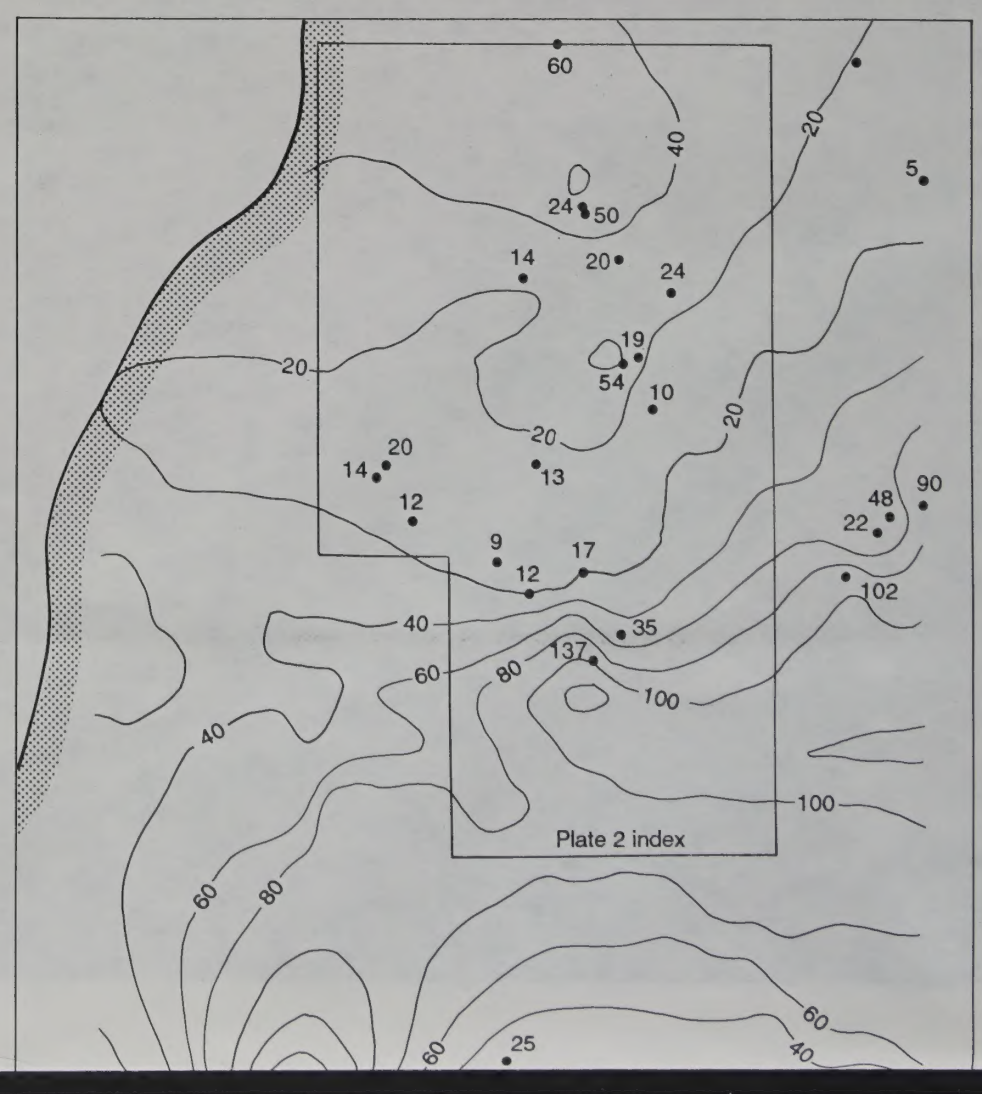
Panel 2

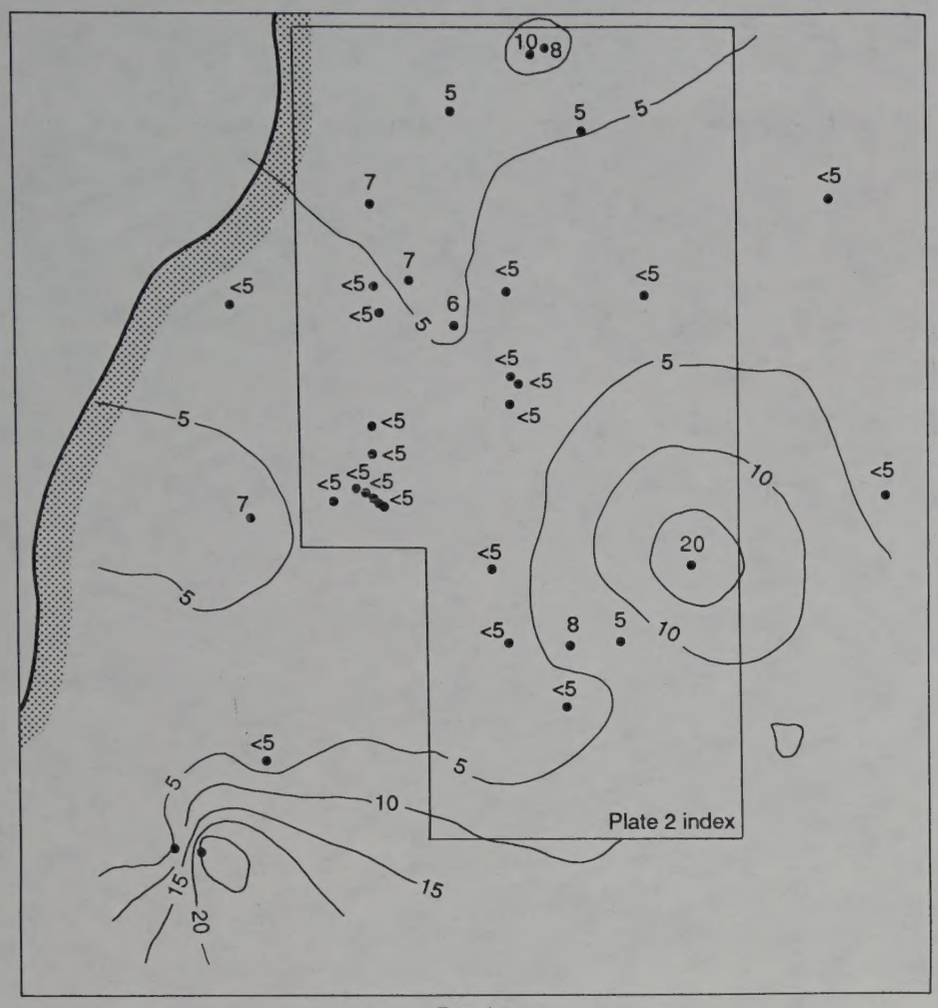
Lead in Tertiary granite samples
posted concentrations in ppm
Study area boundary

N

0 1000 2000 FEET







Panel 3

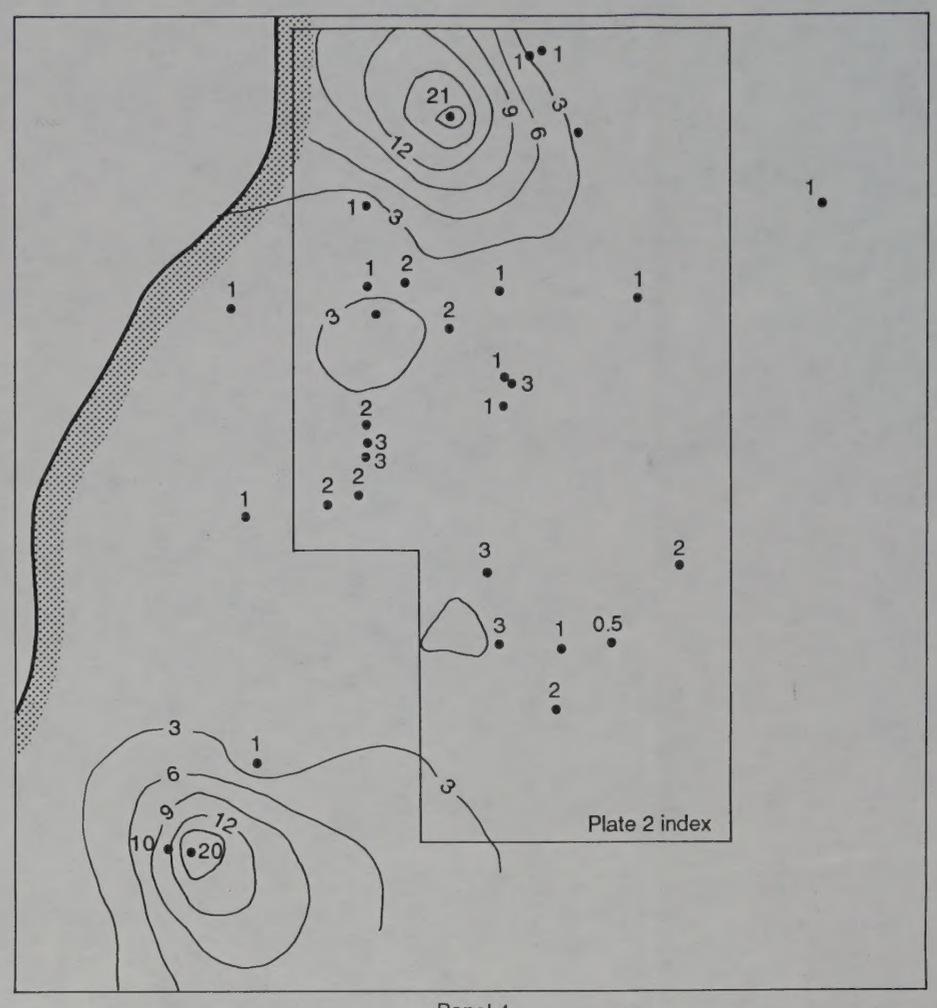
Arsenic in Tertiary granite samples

• posted concentrations in ppm

Study area boundary

N

0 1000 2000 FEET



Panel 4

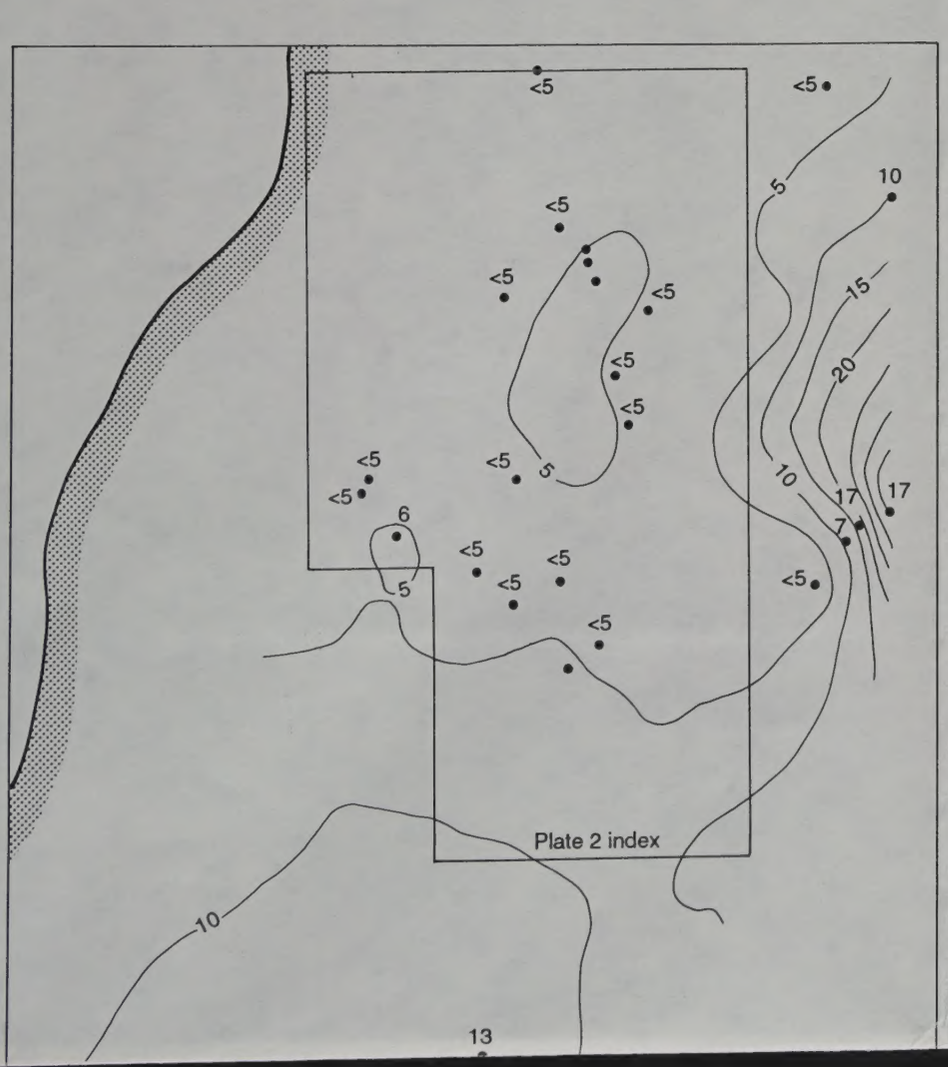
Molybdenum in Tertiary granite samples

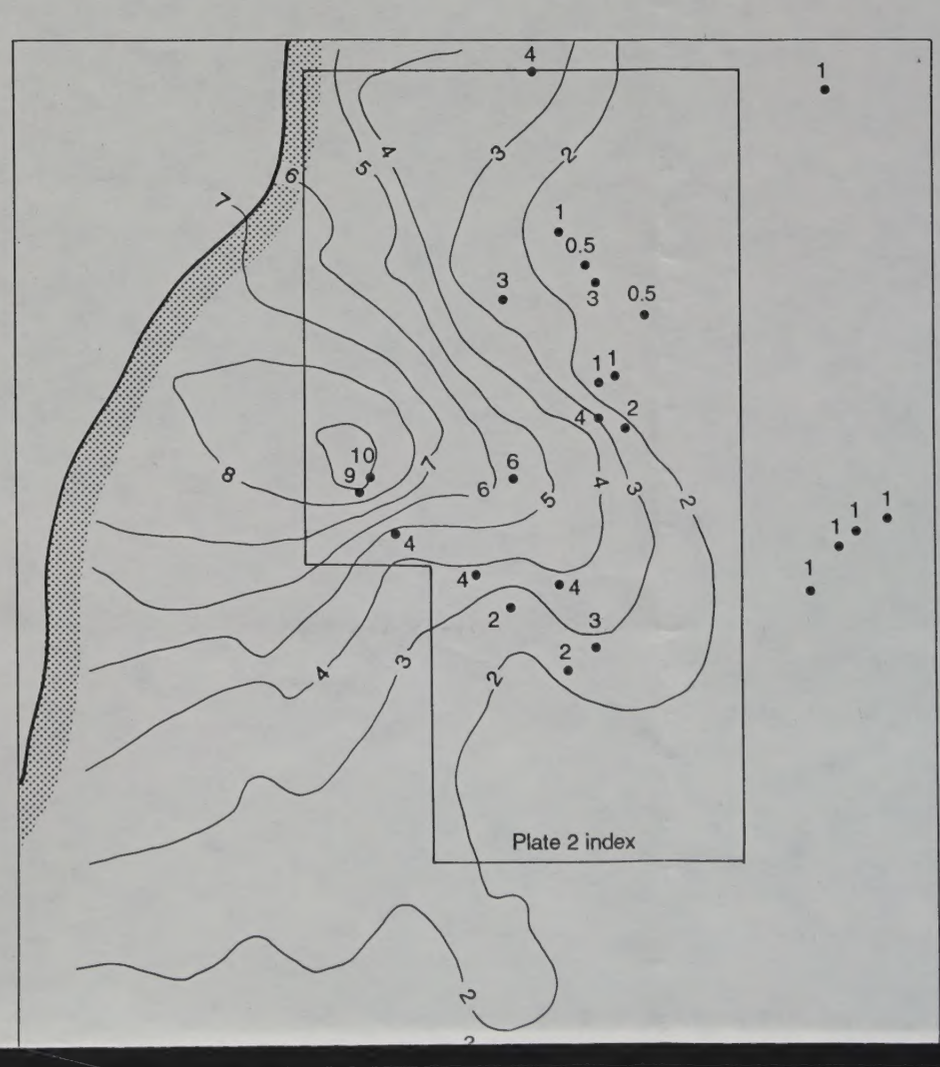
• posted concentrations in ppm

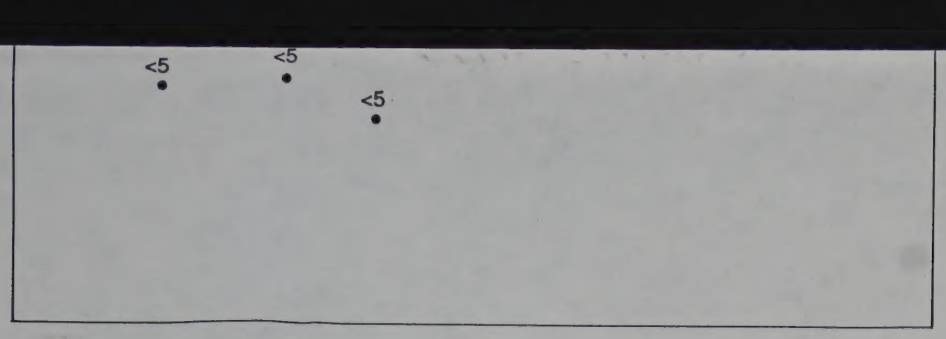
Study area boundary

N

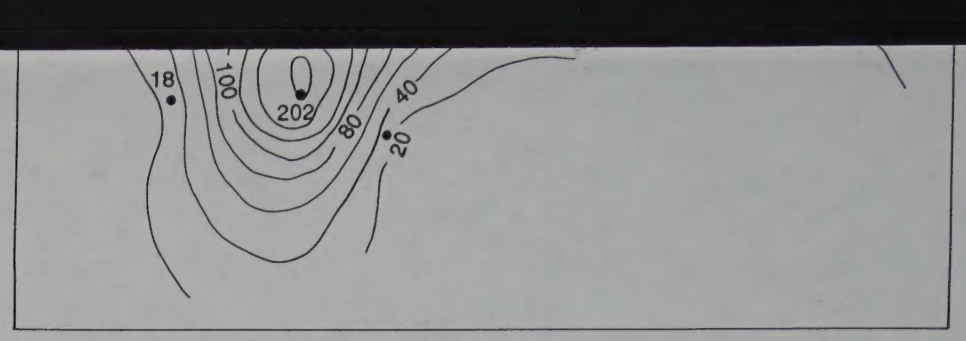
0 1000 2000 FEET







Panel 5



Panel 6

Gold in Tertiary rhyolite samples
• posted concentrations in ppb
Study area boundary

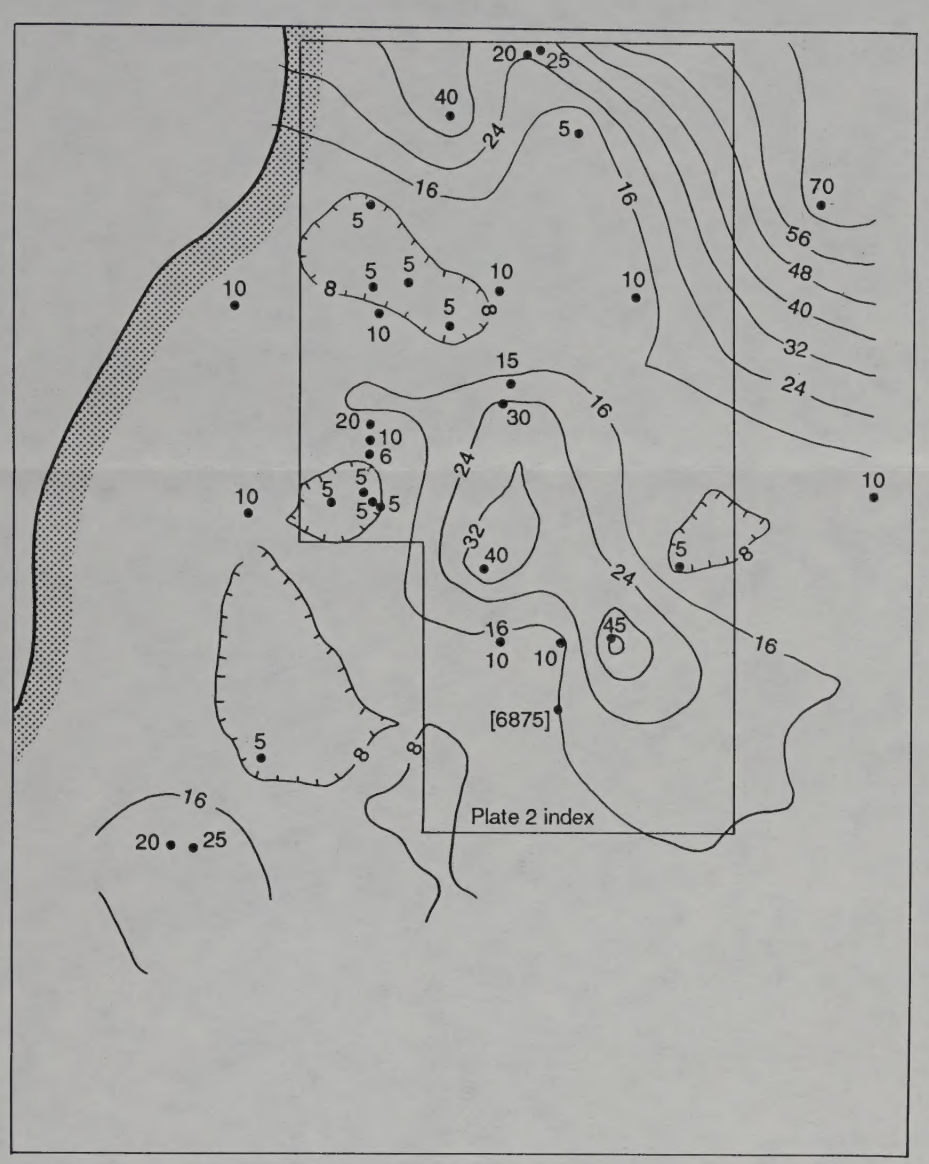
N

0 1000 2000 FEET

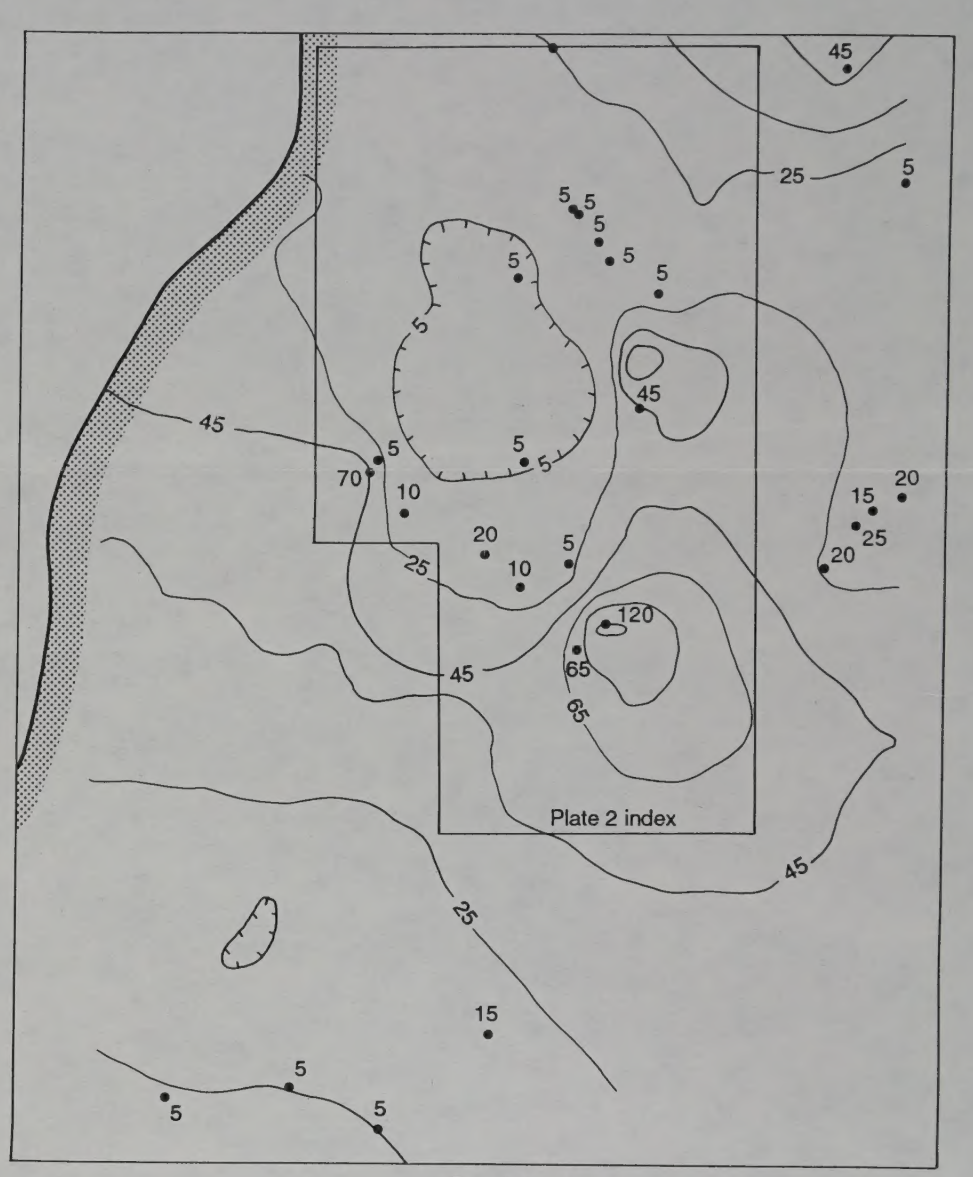
Lead in Tertiary rhyolite samples
• posted concentrations in ppm
Study area boundary

N

0 1000 2000 FEET



Panel 9



Panel 10

Mercury in Tertiary granite samples
• posted concentrations in ppb
[6875] ppb Hg not included in isocon computation
Study area boundary

N

0 1000 2000 FEET

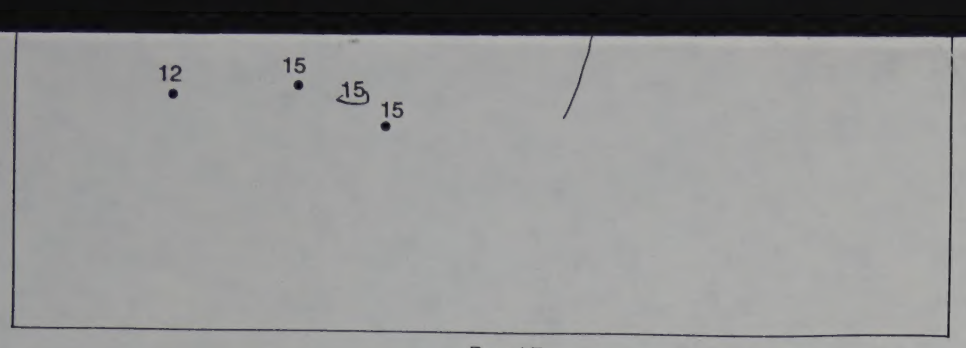
Mercury in Tertiary rhyolite samples
• posted concentrations in ppb
Study area boundary

N

0 1000 2000 FEET

* Isocons by the Kriging method; Kriged isocons do not respect data points as absolutely limiting, and ma

Plate 3.- Isocons of metal concentration i
mineralized area, Hanson Lakes

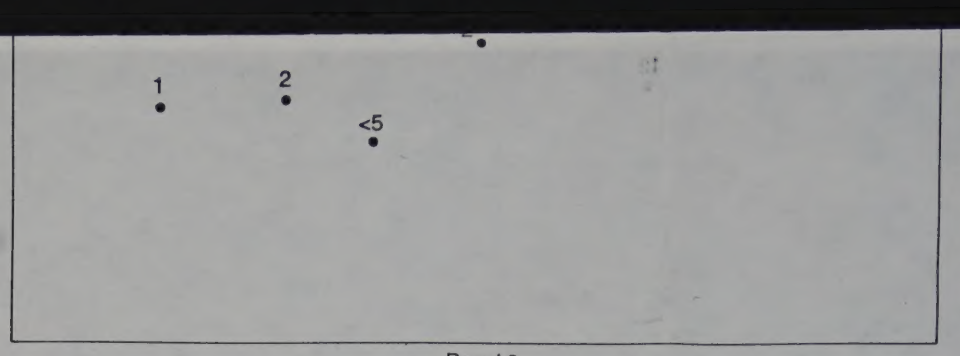


Panel 7

Arsenic in Tertiary rhyolite samples
posted concentrations in ppm
Study area boundary

N

0 1000 2000 FEET

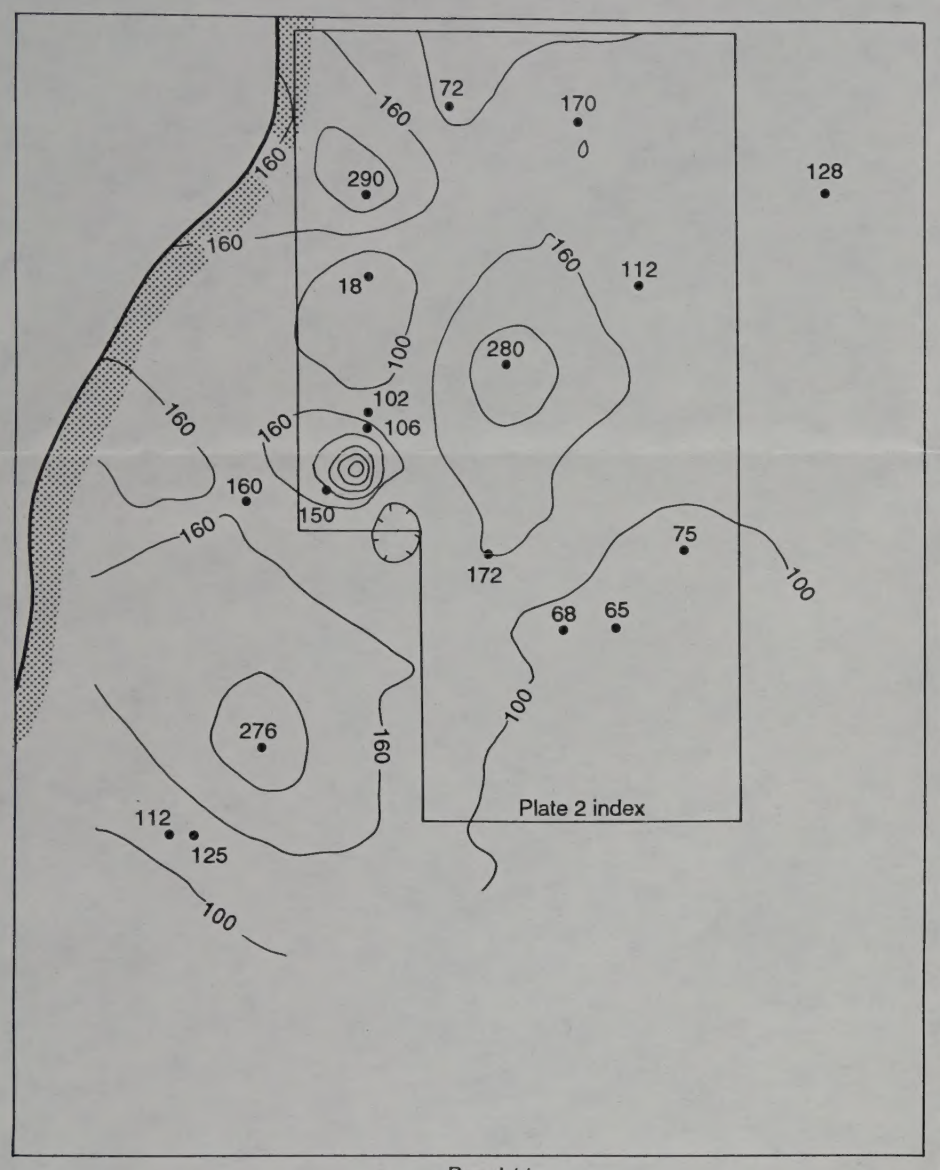


Panel 8

Molybdenum in Tertiary rhyolite samples
posted concentrations in ppm
Study area boundary

N

0 1000 2000 FEET

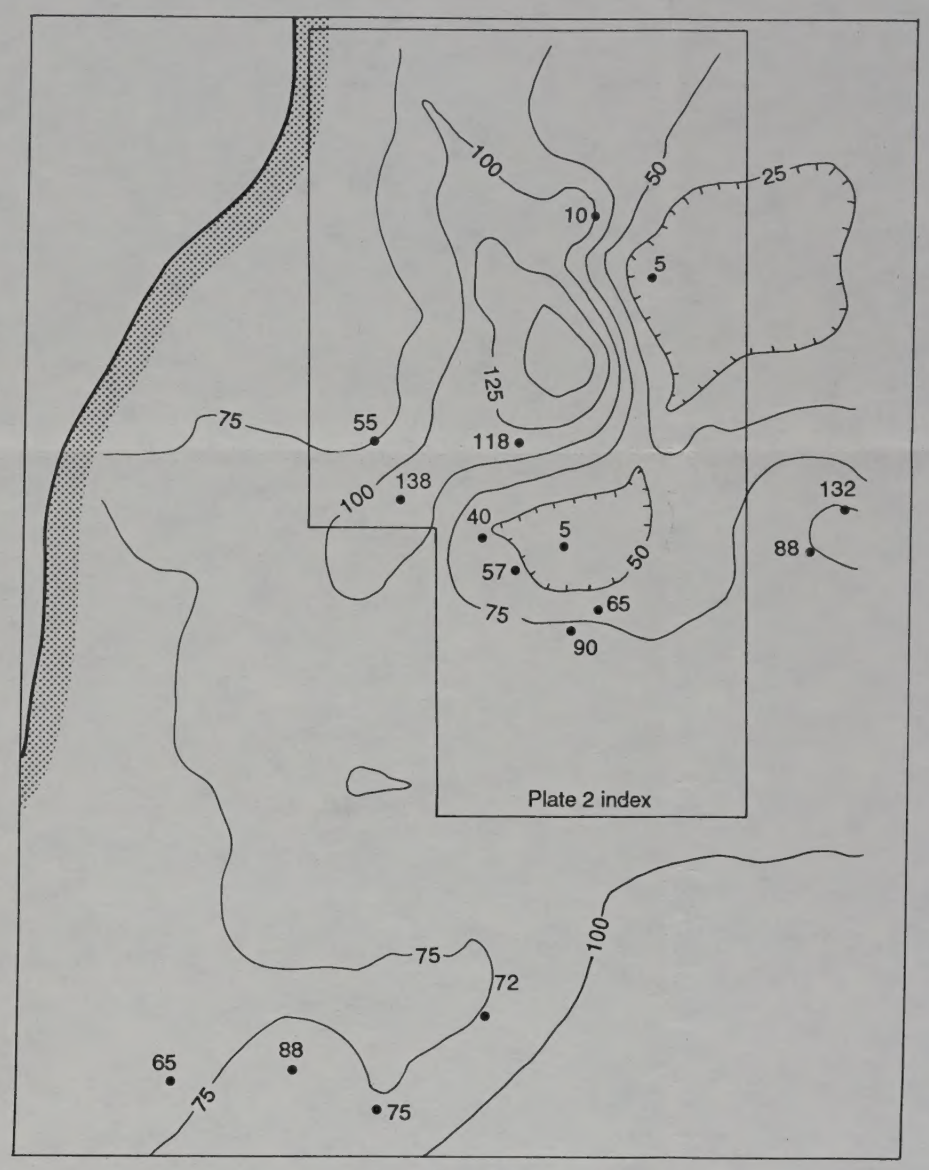


Panel 11

Cerium in Tertiary granite samples
posted concentrations in ppm
Study area boundary

N

0 1000 2000 FEET



Panel 12

Cerium in Tertiary rhyolite samples
posted concentrations in ppm
Study area boundary

N

0 1000 2000 FEET

y locally encompass concentrations below, and exclude values above the isocon

n Tertiary rocks from the Copper Mountain
s study area, Boise and Custer Counties, Idaho